



ALL IN THE MIND
UNDERSTANDING
WHY PILOTS MAKE
DEADLY MISTAKES
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spares system prompts
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FLIGHT

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21-27 APRIL 2015

TURKEY SPECIAL

GOING ON THE ATAK

TAI targets home-grown T129
helicopter at export markets



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COVER IMAGE

This BillyPix shot of the T129 was taken as the Turkish Aerospace Industries type made its Farnborough air show debut last July **P26**



BEHIND THE HEADLINES

The **Flight Daily News** team had front-row seats at the Aircraft Interiors show in Hamburg (P22). Elsewhere, Greg Waldron checked out the prospects for the Chinese business aviation sector, by attending the annual **ABACE** event in Shanghai (P20)



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Our package includes a look at whether sense and avoid technology can enable UAVs to operate in civil airspace

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Piper extends its range with the launch of new flagship M600 **P8**. First Leap-powered A320neo rolls out **P7**



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flightglobal.com/commengines



IMAGE OF THE WEEK

A US Air Force Lockheed Martin MC-130J Commando II takes off from Melrose air force range in New Mexico. The type can take off, land and make airdrops in remote areas. Flightglobal's Ascend Fleets database shows the USAF has 156 C-130Js, with 23 in the special operations MC-130J configuration

View more great aviation shots online and in our weekly tablet edition:



US Air Force

THE WEEK IN NUMBERS

25.4%

ACI World quoted in Flightglobal dashboard

Annual passenger growth at Istanbul's second airport took overall numbers using Sabiha Gökçen in 2014 to 24 million

€1.20

Airbus Group

The 2014 per-share dividend proposed by Airbus Group, 60% up on last year and at the "higher end" of policy

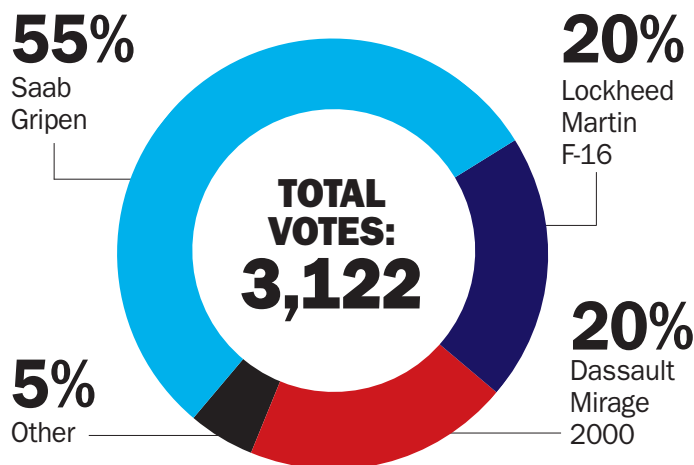
5

Air New Zealand quoted in Flightglobal dashboard

Number of weekly flights to Houston Air New Zealand will operate after revealing Texan city as latest US destination

QUESTION OF THE WEEK

Last week, we asked: **Which aircraft type will Croatia replace its MiG-21s with?** You said:



This week, we ask: **In 2020, most long-haul aircraft will offer how many distinct cabin classes?**

☐ Two ☐ Three ☐ Four ☐ Five

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Cards on the table

Globalised markets – and even the EU – are permitting multinational companies to do business in new ways. The question is, are some of these operating modes compatible with aviation?

The way in which international airlines are conducting business in a globalised marketplace is, in some cases, taking them down roads nobody could have foreseen in the days when markets were more local and businesses straitjacketed by bilateral treaties.

If being multinational allows a company to hunt around for low-tax ways of doing business – and for low-cost employment – as sure as water runs downhill, businesses will take those routes. The EU is a hybrid marketplace containing sovereign states with national laws, taxes and economies. However, the whole is a domestic unit for business purposes, enabling businesses to shop around the member states for friendly taxes, soft regulatory oversight and low wages. Some of this was foreseen – even desired – by the founders, including the economic and societal consequences.

Pilot unions have been warning of a “race to the bottom” on airline employment practices

But one of the effects of multinationalism is that it generates corporate personas stripped of any national ethos. They feel free – indeed obliged – to act in the amoral way people often behave in the anonymous environment of the Internet. This has left many governments nonplussed – they want to host successful businesses, but don't like some of the social consequences.

Where does aviation come into this? Employment practice, particularly among low-cost carriers in Europe, is inexorably going down the road of requiring pilots to be self-employed, but with contracts that rob them of the freedom that self-employment normally confers. So what? They are big boys and girls, and if



Back when markets were more local

they don't like it they shouldn't join. Besides, safety statistics do not, at present, support the argument that this practice puts pressure on these safety-critical employees, affecting the quality of their work.

Whatever misgivings member states may have, they are at a loss about what to do. Meanwhile, Norway – not an EU member but in the European Economic Area – has broken ranks and written to the European Commission. Experience with the aggressively modernist Norwegian Air Shuttle has brought the social issues into sharp focus, and Oslo is challenging the EU to declare its hand on the grounds that these unintended consequences should either be declared completely acceptable, or they should be regulated.

Pilot unions have long been warning of a “race to the bottom” on airline employment practices, and although the Germanwings disaster does not appear to have been precipitated by issues like these, it is a chilling reminder of the power in the hands of a discontented pilot. ■

See Air Transport P12

India's fighting chance

Seasoned watchers of India's slow-moving defence procurement system noted the three-year anniversary earlier this year of its selection of the Dassault Rafale, at a time when a contract signature seemed to be barely a blip on the radar screen.

The Narendra Modi government appears to have shot down the lumbering medium multirole combat aircraft (MMRCA) programme run by its predecessor, instead preferring a swift engagement with its French counterpart. A contract could now be signed within months – but for just 36 Rafales, rather than a previously planned blockbuster buy of 126.

Despite the reduction in numbers, Modi's decision is a tactical success for both sides. For Dassault, it keeps

the momentum created by February's export deal to provide 24 Rafales to Egypt, and the government-to-government business model will spare it the headaches associated with local production requirements that kept the MMRCA paperwork unsigned.

India's air force can field an advanced model with the assurance of assembly being performed by an original equipment manufacturer, and park up more of its ailing MiG-21s sooner. The French-built fighters could be followed by further batches, or joined in formation by cheaper, single-engined companions. This latter suggestion is certain to prompt a whole new dogfight, with types like the Saab Gripen sure to be in the mix. ■

See This Week P6



To access our coverage about a range of current European airline issues, go online at flightglobal.com/dashboard



BRIEFING

BA AND IBERIA TO LEAVE EUROPEAN ASSOCIATION

DISPUTE IAG carriers British Airways and Iberia are withdrawing from the Association of European Airlines (AEA) due to a divergence in policy with other members. The AEA had 29 member carriers at the beginning of this year. IAG says its position on certain "important policy issues" is "not aligned" with those of other legacy carriers within the association. "In particular, we believe global liberalisation of our industry is fundamental to our future growth, and we are not willing to compromise on this fundamental matter," it adds.

AIRBUS WOULD WELCOME END TO INDIA'S 5/20 RULE

REGULATIONS Airbus says it is looking forward to changes India may soon make to its so-called 5/20 rule. Speaking to Flightglobal, Srinivasan Dwarakanath, managing director of Airbus India, says "any changes will help" aircraft sales. Under current regulations, local airlines must operate domestically for five years and have a fleet of 20 aircraft before they can start flying internationally.

ANTONOV HEADING FOR STATE CONTROL

MANAGEMENT Ukraine's government has decided to consolidate Antonov within state-owned industrial conglomerate Ukroboronprom, which has already taken over aero engine designer Ivchenko Progress. Ukroboronprom, which comprises around 100 enterprises within the nation's defence industry and around 60,000 employees, will receive all Antonov assets following the 31 March order.

NEW AMAZON UAV GETS TESTING APPROVAL

DECISION Amazon has received permission from the US Federal Aviation Administration to test a newer variant of its parcel-delivering unmanned air vehicle prototype. The multi-rotor UAV can be flown at speeds below 87kt (161km/h) and at a height of no more than 400ft. It must also be controlled within line-of-sight by an operator who has a pilot's certificate, says the FAA, which describes its move to approve the testing exemptions as "in the public interest".

COPA BEHIND ORDER FOR 61 MAX AIRCRAFT

COMMITMENT Panama's Copa Airlines has announced an order for 61 Boeing 737 Max 8 and 9 aircraft, which had previously been attributed to an unidentified customer. The order was announced during US President Barack Obama's visit to Panama City for the Summit of the Americas. Star Alliance carrier Copa operates Boeing 737-700s and -800s, as well as Embraer 190s. It has 24 737-800s on order, Flightglobal's Ascend Fleets database shows.

EMBRAER NUDGES UP E-JET BACKLOG

OUTPUT Embraer delivered 20 E-175s in the first three months of this year. The deliveries were slightly outpaced by new two orders for 22 E-Jets, increasing its backlog by two aircraft to 454 – including firm orders for 210 E-Jet E2s – from the end of 2014. Embraer plans to continue delivering E-Jets at a rate of 90-95 a year until the transition to the E-Jet E2 family in 2018. The company also delivered 12 business jets in the quarter, including 10 Phenoms and two Legacy 500s.

AVIC BUYS US FASTENER SUPPLIER ALIGN

TAKEOVER China's AVIC has acquired US-based component supply chain firm Align Aerospace for an undisclosed sum. Align is a major distributor of fasteners and other hardware to aerospace and defence original equipment manufacturers and their suppliers. The purchase marks AVIC's fourth major international acquisition.



Reef Features

The French type was already the preferred candidate for MMRCA

ACQUISITION CRAIG HOYLE LONDON GREG WALDRON SINGAPORE

India opts to buy flyaway Rafales

Decision to acquire 36 combat aircraft under bilateral deal appears to have put end to more ambitious plan for type

New Delhi's formal request to directly buy 36 Dassault Rafales from France has underlined the challenging obsolescence issues facing the Indian air force, and appears to have marked the end of its stalled medium multirole combat aircraft (MMRCA) programme.

Announced during a 10 April visit to France by Indian Prime Minister Narendra Modi, the new deal will be conducted under a government-to-government framework. Media reports in India suggest an order could take between three and six months to finalise.

Under the MMRCA programme, for which the Rafale was named the preferred candidate in early 2012, 18 of the total 126 aircraft were to have been delivered directly from France, with the balance produced in India by Hindustan Aeronautics (HAL).

Industry sources had previously indicated that a stumbling block to the conclusion of the MMRCA deal was Dassault's reluctance to guarantee the quality of aircraft produced by HAL, as well as its high price.

Statements attributed to Indian defence minister Manohar Parrikar following the surprise direct purchase announcement noted that the MMRCA programme discussions had "gone into a loop with no solution in sight", and that "a car cannot run on two paths simultaneously". India's

preference to acquire Rafales in a flyaway condition directly from the manufacturer follows the success of its purchase of types including the Boeing C-17 strategic transport and Pilatus PC-7 Mk II basic trainer. It also underscores the urgency of the need to replace its air force's aged Mikoyan MiG-21 fighters.

Dassault chief executive Eric Trappier says the company will work to finalise an order at conditions that will allow it "to rapidly meet the security needs of India". The success builds on its receipt in February of a 24-aircraft export order from Egypt.

The Indian air force – which could potentially acquire more Rafales later via the government-to-government mechanism – could also now have an additional need to acquire more affordable single-engined combat aircraft. This would help ensure that it maintains a structure of 20 frontline squadrons – and cover for the HAL-built Tejas light combat aircraft having failed to meet its requirements.

Any such opportunity could attract the attention of previously rejected MMRCA bidders, including Lockheed Martin, RAC MiG and Saab, which respectively offered their F-16, MiG-35 and Gripen NG products.

The air force also plans to introduce a version of the Sukhoi-developed T-50 fighter. ■



Two become One as
Kestrel joins
Eclipse in merger
THIS WEEK P8

THIS WEEK

DEBUT DAVID KAMINSKI-MORROW LONDON

First Leap-powered A320neo rolls out

Following emergence from hangar CFM-engined narrowbody will join two examples with rival PW1100G in test programme

Airbus's A320neo programme has reached a further significant milestone, with a first test example fitted with CFM International Leap-1A engines having been rolled out.

The aircraft – which emerged at the company's Toulouse site on 13 April – is the third A320neo to have been produced in support of the manufacturer's certification programme for the enhanced type. The previous two examples – the first of which entered flight testing in September 2014 – are equipped with Pratt & Whitney PW1100G powerplants.

CFM already produces the CFM56 for the current A320 family, but the Leap is designed to slash fuel-burn on the re-engined variant. "The next step will be ground tests leading to first flight," CFM says in a brief statement about the roll-out.

Airbus has yet to reveal a target date for the Leap-1A version's maiden flight. Flightglobal's Ascend Fleets database records Airbus as having so far secured orders for almost 3,450 A320neos. ■



The aircraft is the third to have been produced in support of the manufacturer's certification effort

AVIONICS

EASA to order sensor refit after uncommanded descent

Safety authorities in Europe are to order the replacement of specific angle-of-attack sensors on Airbus A320-family and A330/340 jets to guard against potential air data problems. The decision follows the uncommanded descent of a Lufthansa A321 last November, which was traced to the blockage of its sensors during climb.

In a proposed airworthiness directive, EASA says aircraft fitted with certain UTC Aerospace Systems or Sextant sensors appear to have "greater susceptibility" to adverse environmental conditions than the latest Thales sensor, which was designed to improve angle-of-attack indications in heavy rain conditions.

EASA says the replacement of the UTC and Sextant sensors is a "necessary precautionary measure" to improve safety. It gives a compliance time of six months for the A318 and A321, and 21 months for the other aircraft types. The agency's proposal also requires repetitive detailed visual inspection and functional heating tests of specific Thales sensors. ■

MANUFACTURING FELIPE SALLES RIO DE JANEIRO

Embraer confirms production role on Gripen NG

Embraer will receive a "relevant and highly significant" transfer of technology package under a new agreement with Saab to support the Brazilian air force's Gripen NG purchase, says Jackson Schneider, president of Embraer Defense and Security.

Finalised on the opening day of the Latin American Aviation and Defence show in Rio de Janeiro, the pact concludes more than a year of negotiations since Brazil selected the type in December 2013.

Embraer will be involved in finalising the single-seat fighter's design for Brazil, and with Saab will develop a two-seat variant in the country. A production line will be established at its



Brazil's 36-strong order has been referred to as "the first tranche"

Gavião Peixoto site, with the company responsible for software development and integration, final assembly, flight tests and delivery.

A new centre for the development of jet aircraft technology will also be set up at the site with Saab and other programme partners. Brazil's 36-aircraft order has been

referred to by the companies as "the first tranche", confirming that they are working to increase the number of fighters to eventually be ordered.

Schneider says the agreement will guarantee Brazil the control of new and advanced technology, and export deliveries could be made from around 2023 or 2024.

Also speaking at the show, Brazilian defence minister Jacques Wagner said he "believes that the UK government will not try to stop the requested sale of 24 Gripen NG fighters built in Brazil to the Argentine air force".

In October 2014, Wagner's Argentinian counterpart Agustín Rossi revealed interest in acquiring the type from a Brazilian line. Such a deal could face opposition from London.

Wagner says that to overcome any "obstacles" from supplier nations in the manufacture of Brazilian-built aircraft, Embraer might have to substitute blocked components, but does not say who would pay for such redesign and recertification work. ■



CONSOLIDATION KATE SARSFIELD FRIEDRICHSHAFEN

Two become One as Kestrel joins Eclipse in merger

Reborn manufacturer of EA550 and developer of KA350 turboprop unite to promote aspiration of general aviation

Eclipse Aerospace and Kestrel Aircraft are merging, with the long-term goal of producing a range of aircraft and services – and shaking up what they call the “under-utilised and under-developed general aviation market”.

Both companies are relative newcomers to the general aviation industry. Eclipse Aerospace is the manufacturer of the EA550 very light jet (VLJ), while Kestrel Aircraft is the

developer of the KA350 single-engined turboprop.

They have now joined forces under the brand name One Aviation, aiming to serve a broad base of aviation customers from newcomers to seasoned users. “For too long this industry has failed to communicate the value of GA to a mass audience and this has really stifled its potential and subsequently its growth,” says Kestrel Aircraft founder and chief executive Alan Klapmeier, who heads the new venture.

“People are put off by its artificial barriers,” he continues. “Many believe this industry is just for the privileged few, but we plan to remove that idea. In 10 years time, we will be selling aircraft to people for whom today it is only a dream.”

“In 10 years time, we will be selling aircraft to people for whom today it is only a dream”

ALAN KLAPMEIER
One Aviation



Sales of the very light jet will help fund further developments

One Aviation plans to offer a range of aircraft products from new designs to out-of-service types that could be acquired and upgraded. It may also include in-service models, added to its line-up through company mergers.

“We are looking for aircraft with good DNA,” Eclipse and One Aviation president Kenneth Ross said at the Aero Friedrichshafen show in Germany on 15 April. “We are currently in discussion with a couple of companies.”

Klapmeier anticipates that the new venture will give the KA350 programme new momentum, after Kestrel Aircraft struggled to secure sufficient funding to bring the seven-seat high performance single to market.

“We are already three years late on a three-year project,” he

quips, referring to the aircraft’s original development schedule. “Under One Aviation, the KA350 will definitely come to market, as the project – now in its detailed design phase – will be funded through the sales of the EA550.

“It is now vitally important that we start to step up the marketing and sales effort for this VLJ and start to communicate this aircraft’s unique selling points: something Eclipse hasn’t done that well so far,” Klapmeier says.

“They have focused on putting the finishing touches to the EA550, but not on selling the aircraft – which is why they only delivered around 12 aircraft last year. We need to bring the EA550 to the customers and show them why they would want one.” ■

TURBOPROPS KATE SARSFIELD FRIEDRICHSHAFEN

Piper extends range with launch of flagship M600

Piper has launched a new single-engined turboprop – the M600 – to sit at the head of its nine-strong family of business and general aviation aircraft.

At the same time, the US airframer has revamped and

renamed its Mirage piston single as the M350.

“These new M-class models offer more performance, range, efficiency, comfort and safety than ever before,” says Piper president and chief executive

Simon Caldecott. “When I took on this role I made it my mission to place Piper ahead of the pack. I am well on my way to doing that and I still have a number of other cards up my sleeve.”

The company also recently upgraded and rebranded its Meridian turboprop single, which is now called the M500.

Launched at the Aero Friedrichshafen show in Germany, the M600 is based on the M500, but features a redesigned wing and advanced digital fuel management technologies. Piper says these combine to give the new model a maximum range of 1,300nm (2,405km) – nearly 240nm further than the M500.

Powered by a Pratt & Whitney Canada PT6A-42A engine, the

M600 is also the first turboprop platform to feature the Garmin 3000 flightdeck. Priced at \$2.8 million, the aircraft is scheduled for certification and service entry in the fourth quarter of this year.

Meanwhile, Piper’s \$1.16 million M350 secured certification on 10 April, and the company says four aircraft will be handed over to customers this month. The six-seat, Lycoming TIO-540-AE2A-powered aircraft features a G1000 cockpit and numerous safety enhancements, including a hypoxia-recognition system and pulse oximeter to measure the pilot’s blood oxygen level and heart rate.

Piper’s range also includes the entry-level, \$345,000 Archer piston single, and the \$1 million Seneca piston twin. ■



The new model will feature advanced fuel management systems



AW119 pitched to meet USN trainer requirement
THIS WEEK P10

THIS WEEK

MAINTENANCE STEPHEN TRIMBLE WASHINGTON DC

F-35 support plan under fresh scrutiny

Department of Defense to re-examine JSF sustainment strategy after struggling ALIS system falls short of expectations

The US Department of Defense is revamping a 14-year-old strategy for maintaining a global fleet of Lockheed Martin F-35s that relies heavily on a currently dysfunctional automated system and a just-in-time logistics model managed by the contractor.

The sustainment plan is “evolving” less than three months before the US Marine Corps is set to declare its first F-35B unit operational, Sean Stackley, assistant secretary of the navy for research, development and acquisition, told the House Armed Services Committee (HASC) on 14 April.

Lockheed’s current concept for ordering spares for the F-35 relies on the autonomic logistics infor-



Maintainers at Eglin AFB have battled a high false alert rate

mation system (ALIS). This was designed to receive downloaded information from the aircraft during and after each sortie, then automatically detect and troubleshoot all systems and parts failures and generate orders for spare or replacement parts.

US Air Force maintainers at Eglin AFB in Florida voiced several concerns about ALIS during a recent visit by US lawmakers, says Representative Michael Turner, chairman of the HASC’s subcommittee on tactical air and land forces.

Stackley agrees that the just-in-time logistics model should be changed. “The operations and sustainment plan for the programme is evolving and being developed frankly to do better than what you’re hearing from maintainers today on the flight line,” he says.

ALIS was conceived as one of the most forward-thinking aspects of the tri-service F-35 programme, but has proven far less reliable

than expected. The five million lines of software code include many bugs, and maintainers at Eglin AFB reported a false positive rate of about 80%, says Turner. The system was also too bulky to deploy on the amphibious assault ship *USS Wasp* during embarked testing of the F-35B.

Lt Gen Chris Bogdan, executive officer of the DoD’s F-35 joint programme office, notes that the high false positive rate reported by maintainers was partly attributable to the concentration at the base of early-model F-35s, which are the “dogs” of the fleet, and that a lightweight version of ALIS will be ready when the USMC declares initial operational capability. ■



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SPACEFLIGHT DAN THISELL LONDON

SpaceX recovery remains elusive

Company successfully launches Dragon supply mission to ISS but first stage of Falcon rocket crashes after descent

Private-sector spaceflight company SpaceX chalked up a partial success on 14 April, launching its supplies-laden Dragon capsule to the International Space Station (ISS) – but failing to recover the first stage of its Falcon 9 rocket, which crashed on a barge meant to receive it following a powered descent.

Flown under contract to NASA as CRS-6, the mission marked SpaceX's second attempt to recover a rocket stage. Another Falcon 9 stage suffered a similar fate in January, and rough Atlantic weather made it impossible to deploy the autonomous barge for another flight in February.

SpaceX founder Elon Musk said on Twitter of the recovery attempt: "Rocket landed on drone-ship, but too hard for survival. Looks like Falcon landed fine, but excess lateral velocity caused it to tip over post-landing."

During about five weeks in orbit, the Dragon capsule will have its nearly 2,000kg (4,400lb) of supplies for the ISS's six astronauts unloaded, and be packed with about 1,300kg of completed science experiments and waste. It will then be released for recovery, for a splashdown in the Pacific Ocean off Southern California.

Later versions of Dragon will be capable of launching astronauts from US soil for the first time since the Space Shuttle fleet was retired in 2011, with SpaceX and Boeing to provide that service to NASA from 2017.

A successful rocket stage recovery would be a first, and cut launch costs – which for a Falcon 9 can be \$70 million or more. Musk believes that ambitious plans such as colonising Mars will only be financially possible with reusable spacecraft.

Two near-misses, and a powered "soft splashdown" in 2014, suggest that SpaceX may be near to success with a first-stage recovery. However, other launcher components may remain disposable. Musk has said that efficiency will have to be doubled to push about 4% of launchpad mass to orbit, in order to make up for the extra launcher mass associated with robust construction, landing gear and – in the case of Falcon 9 – a fuel load for descent. That is no easy target.

As NASA's Space Shuttle also demonstrated, reusability is difficult to achieve in practice. The runway landing orbiter never came close to achieving envisioned turnaround times between flights. ■



The aged TH-57 SeaRanger is becoming harder to support

ROTORCRAFT STEPHEN TRIMBLE WASHINGTON DC

AW119 pitched to meet USN trainer requirement

AgustaWestland and Bristow Helicopters have teamed up with simulator supplier Rockwell Collins and training services provider Doss Aviation in offering to replace the US Navy's 117 Bell Helicopter 206B3 basic trainers with an upgraded version of the AW119 under a fee-for-service contract.

The USN has been evaluating options for replacing its aged TH-57 SeaRanger fleet since August 2013, with obsolescence issues having increased after Bell stopped building the variant in 2010.

The AgustaWestland/Bristow-led team is offering to introduce 80-85 AW119s over a four-year

period for a cost no greater than the navy is already spending to operate its ageing TH-57s.

"The response [from navy officials] has all been positive," says AgustaWestland North America chief executive Robert LaBelle.

The proposal includes a plan to upgrade the single-engined type – a variant of the twin-engined AW109 – with avionics and wiring eligible for instrument flight rules certification, which could help generate additional commercial sales.

Airbus Helicopters is offering the twin-engined H135 and single-engined H125 to the navy under a conventional procurement arrangement. ■



Successfully recovering launchers will cut the cost of missions

DISAPPEARANCE

MH370 search area to expand

Malaysia, Australia and China have agreed to extend the search area for Malaysia Airlines flight MH370 by an additional 60,000km², should the missing Boeing 777-200ER not be found within the current search zone.

The extension would double the size of the total area searched, covering the "entire highest probability area identified by expert analysis", says Australia's deputy prime minister Warren Truss.

"We're following the seventh arc, the seventh handshake and that is the flight path. We will extend north, south, east and west, expanding the area within the high priority area," says Malaysian transport minister Liow Tiong Lai.

More than 60% of the first phase priority search area has now been checked, with the activity to be largely complete during May. An extended search could take up to another year to complete, and cost over \$38 million. ■



Norway studies
'fragmented'
airlines
AIR TRANSPORT P12

DISPUTE GHIM-LAY YEO WASHINGTON DC

USA to review Gulf subsidy allegations

Washington will examine American carriers' claims that Etihad, Emirates and Qatar Airways have received \$40bn support

After months of intense lobbying, the US government had said it will review claims by three US airlines that their state-owned Gulf rivals received more than \$40 billion in alleged subsidies.

The Departments of Commerce, State and Transportation are inviting interested parties to submit information online, with a review scheduled to begin by the end of May.

In March, Delta Air Lines, United Airlines and American Airlines released a white paper alleging that Emirates, Etihad Airways and Qatar Airways had received more than \$40 billion in state subsidies from their respective governments.

The three Gulf carriers have strongly denied these allegations, and at least two of them – Emirates and Etihad – have held talks with US government officials to defend themselves. Qatar Airways chief executive Akbar Al Baker, meanwhile, is expected to visit Washington DC later this month.

The US carriers have been collectively lobbying their government to take action under existing open skies agreements with the United Arab Emirates and Qatar, and are calling for US

"Etihad is committed to setting the record straight regarding these allegations"

ETIHAD AIRWAYS



Qatar Airways is one of the three airlines which will be investigated by the departments

authorities to prevent the Gulf carriers from expanding service to the USA in the meantime.

Americans for Fair Skies, an organisation that is supporting the US airlines in their campaign, welcomed the US government's decision to review the allegations.

"This is an important first step towards restoring fairness to our skies and stopping the largest trade violation in history," the organisation says.

Etihad says it "applauds" the US government "for setting up a transparent process to deal fairly and responsibly with the claims".

"Etihad Airways is committed to setting the record straight regarding these unsubstantiated allegations," it says.

Emirates and Qatar Airways did not immediately comment on the US government's action. ■

RESULTS EDWARD RUSSELL WASHINGTON DC

US carrier profits to soar on weaker oil

Wall Street analysts expect US carriers to report record profits in the first quarter, driven largely by lower fuel prices.

Pre-tax profits of US airlines are expected to range from \$3.5 billion, says Deutsche Bank, to \$3.8 billion, says Buckingham Research, reports released on 15 April show. The industry reported about \$2.8 billion in pre-tax profits a year ago.

Lower fuel prices are driving the majority of the increase. Buckingham estimates that airlines will save about \$3 billion in fuel expenses while revenues will increase by only about \$800 million during the quarter compared with 2014.

The spot price of a barrel of Brent crude was \$59.08 on 14 April, data from Bloomberg shows. This is up

more than 30% from a low of \$45.13 per barrel in January but down nearly 50% from a peak of over \$114 in June 2014.

Analysts are keeping a close eye on capacity. Programmes adding seats to existing aircraft at all of the major US carriers have driven up capacity growth, which is expected to increase between 5% and 6%, according to Morgan Stanley.

Alaska Airlines, American Airlines, Frontier Airlines, Southwest Airlines and United Airlines all have programmes that add seats to their current fleets. For example, American added 10 seats for a total of 160 to 221 Boeing 737-800s in 2014. The additions are a big driver of the 2% to 4% increase in available seat miles it forecast for the first quarter. ■

SAFETY DAVID KAMINSKI-MORROW LONDON

Dublin taxiways closed after second wing-tip collision

Ireland's civil aviation regulator has halted the use of two taxiways at Dublin airport following a second wing-tip ground collision involving two Ryanair Boeing 737-800s within six months.

The Irish Air Accident Investigation Unit, in a preliminary bulletin into the 1 April incident, highlights the similarities with an event on 7 October last year.

In each case both of Dublin's runways, designated 28 and 34,

were being used for departures. The runways converge at their thresholds, meaning that aircraft manoeuvring for 28 and 34 are funnelled through the same tight taxiway links. Investigators state that, in both cases, one aircraft

heading for runway 34 hit a second stationary aircraft waiting in the taxiway links for runway 28.

Following the latest incident the Irish Aviation Authority has withdrawn the problematic taxiways, A and B2, from service. ■

LABOUR RELATIONS DAVID LEARMOUNT OSLO

Norway studies 'fragmented' airlines

Country's transport ministry is assessing the impact of airlines' innovative employment practices on the wider industry

Norway's government is conducting an investigation into the "fragmentation of airline structures" in Europe, warning that it does not want to see "brutal" labour arrangements institutionalised.

The study, conducted by the Ministry of Transport and Communications, will look at "atypical employment practices" within the industry, says state secretary Tom Cato Karlsen.

Speaking at the Flight Operational Forum in Oslo on 14 April, Karlsen said the "fragmentation" of airlines "presents problems for regulators". He did not specifically mention Norwegian, but the low-cost carrier has a record of pushing business practice boundaries in its search to reduce tax and employment costs, something that has been a debating point in Norway's parliament for some time.



Norwegian's methods have been debated in Oslo parliament

Karlsen says the government wants to see "successful, innovative and competitive" businesses in Norway, benefitting consumers, but warns that "there is a line between those practices we can accept and those we should not". While striving to cut costs is acceptable, he told the forum,

"measures intended aggressively to avoid taxes" are not.

He says his department has written to the European Commission suggesting that Europe should not accept unusual business practices by default, simply because they do not breach existing laws. It should declare what

is acceptable and legislate accordingly, because practices that were not foreseen or intended by governments are now becoming common, he says.

Norway is not an EU member but, along with Iceland, Liechtenstein and Switzerland, is part of the European Free Trade Association which cooperates closely with the EU.

The common practice among EU-based low-cost carriers of setting up bases with locally-hired employees all over the continent is not a problem in itself, he says, but depending on how it is executed, it can create "fragmentation" if it involves "atypical employment practices". These can include requiring pilots and cabin crew to be self-employed or work for an agency contracted to the airline, which he says can create "statelessness" among some employees. ■

AUDITS DAVID KAMINSKI-MORROW LONDON

Smaller carriers to get IATA safety reviews

IATA has formally initiated a new assessment scheme for smaller operators, designed to complement the compulsory operational safety audits it conducts for member carriers.

The IATA Standard Safety Assessment (ISSA) is intended for operators with business models that are incompatible with audit specifications or whose aircraft are below the 5.7t maximum take-off weight threshold.

"There are hundreds of operators with no interest in joining IATA or which operate aircraft outside the [audit] criteria," said IATA director general Tony Tyler, speaking at the association's operational safety conference in Los Angeles.

He says the ISSA is "not a substitute" for its audit programme but that it will address global safety standards for operators not eligible for the current scheme.



A spate of recent accidents has "upended" assumptions

Tyler adds that events such as the loss of Malaysia Airlines flights MH370 and MH17, as well as the Germanwings crash in the French Alps, have "upended" the

assumptions about air safety. While reactive measures have been put in place to reduce the risks of similar occurrences, Tyler says that the statistical rarity of fatal accidents, particularly those involving extraordinary circumstances, makes them increasingly difficult to counter.

"Much of the low-hanging fruit that can deliver major safety improvements has been harvested," he states.

"As a result, there are so few accidents that they cannot yield the trend data that is vital to a systemic risk-based approach to improving safety."

Safety advances in future will require analysis of all flight data, says Tyler, not just the "infinitesimal percentage" of those involved in an incident. ■

David Learmount offers his views on aviation safety issues: flightglobal.com/learmount

REPORT JON HEMMERDINGER WASHINGTON DC

FAA is urged to tighten air traffic cyber-security

The US Federal Aviation Administration's failure to adequately evaluate and model cyber-security risks has left the nation's air traffic control system vulnerable to cyber-based threats, says the Government Accountability Office (GAO) in a report on 14 April.

"[The] FAA has not developed a holistic threat model that would describe the landscape of security risks to FAA's information systems. Such a model would inform the ongoing implementation of FAA's cyber-security efforts to protect the national airspace system," it says.

The report notes that risks from hackers could become more acute as the agency implements "inter-connected" computer systems that are key to its NextGen air traffic control modernisations. ■



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PROPULSION STEPHEN TRIMBLE MOSCOW

MC-21 engine to use 3-D printed parts

Additive-manufactured component will feature on Aviadvigatel PD-14, an option for Irkut's in-development narrowbody

ARussian company will use additive manufacturing to make a key component in the combustor for a new turbofan engine now in development to power the Irkut MC-21.

The swirler device that feeds air into the combustion chamber of the Aviadvigatel PD-14 powerplant will be made using additive manufacturing technology, says Masalov Vladislav, general director of the Moscow-based United Engine Corporation.

The PD-14 is one of two engine options for the MC-21, competing against the Pratt & Whitney

PW1400G geared turbofan.

The PD-14 is considered to be a major breakthrough for the Russian commercial aviation industry. With an 8.6:1 bypass ratio, it will be the most fuel-efficient jet propulsive system yet to have been developed by a Russian manufacturer.

In a public presentation last February, Russian industry officials first disclosed that a laser sintering system – an additive manufacturing tool – had been used to create a component in the combustor using a domestically-sourced metal powder, but did not name the specific part involved.

By announcing the swirler as the target for additive manufacturing, Aviadvigatel has selected a component in the hot section of the engine core. That follows the lead of the CFM International



A choice of Western or Russian powerplants will be available

joint venture, which is poised to begin mass producing fuel nozzle discs using a similar selective laser sintering machine.

As Russia's most advanced commercial engine to date, the PD-14 also features hollow titanium, wide chord fan blades. It is scheduled to be certificated by Russian authorities in 2017 and by the European Aviation Safety Agency one year later.

On 1 April, P&W announced that two components – synch ring brackets and compressor stators – of its PW1500G, the exclusive powerplant for the Bombardier CSeries, will be made using additive manufacturing.

The US manufacturer also is considering applying additive manufacturing in the same components for other versions of the geared turbofan. ■

The PD-14 will be the most fuel-efficient jet system yet developed by a Russian engine manufacturer

GROUNDING TOM ZAITSEV MOSCOW

End of the line for Rossiya's An-148s

Aeroflot subsidiary Rossiya has grounded all six of its Antonov An-148 regional airliners.

The St Petersburg-based carrier says it is carrying out "a programme aimed at optimising operational activities to cope with a worsening market situation".

"In terms of per-seat-kilometre costs and other criteria, overall economic efficiency of the An-148 is lower compared with that of other aircraft types in our fleet," adds the Russian airline.

A source at the carrier reveals

that Rossiya has also encountered sporadic difficulties in providing maintenance for An-148s due to disruptions in spare parts supply from Ukraine. "They began at the end of last year," he says. "Our talks with Ukrainian suppliers had continued until early March, when we decided to ground An-148s."

Rossiya acquired six An-148s – assembled by domestic airframer VASO – under a financial lease arrangement made with lessor Il-yushin Finance in 2009 and has

been the largest commercial operator of the type.

Between them, Antonov and VASO have built a total of 35 An-148s.

Siberia's Angara Airlines has five An-148s in service. "We have no plans to ground them," the carrier says. "Despite seasonal fluctuations in demand, we're not going to suspend the An-148-100 from services. This type proves to be economically efficient on our intra-regional routes, especially in northern territories." ■

EVACUATION
DAVID KAMINSKI-MORROW
LONDON

Jet Airways 737 damaged during landing incident

One of Jet Airways' Boeing 737-800s has sustained damage to its main landing gear after an incident at Khajuraho, in the north of India.

The aircraft had been operating domestic flight 9W2423 from the eastern city of Varanasi.

Jet Airways says that the 737 experienced a "technical problem" with the landing gear after touchdown.

Evacuation slides were deployed and the carrier says all 59 passengers and eight crew were able to disembark from the aircraft safely.

Images from the scene showed the aircraft's left-hand main gear compressed to the extent that the left-hand CFM International CFM56 engine was contacting the ground. ■



The carrier became the largest commercial operator of the type after acquiring six examples in 2009



Rocket trials bang on target as Tiger tests killer instinct
DEFENCE P16

PROGRAMME GREG WALDRON SINGAPORE

MRJ test schedule hit by fresh delay

Manufacturer says regional jet's first flight now expected in September or October, but deliveries will not be affected

Mitsubishi Aircraft has confirmed that the first flight of its MRJ regional jet has been pushed back from the second quarter to September or October.

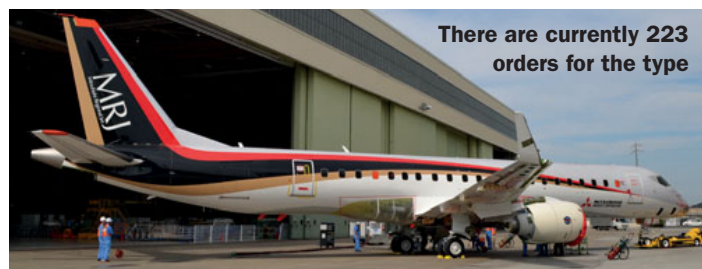
The Japanese airframer has also finalised details about its plan for expanding the production base for the programme.

Mitsubishi says the latest delay will not impact deliveries, due to begin in the second quarter of 2017. "Presently static strength testing and manufacture of the second and subsequent flight test aircraft are all proceeding smoothly," says the company.

"In order to fully incorporate the verification results of the various ground tests and related feedback into the first flight test aircraft, the timing of the first flight has been reviewed and is now scheduled for September or October of this year."

Subsequently, the airframer says it will conduct an "intensive" flight test campaign, and accelerate production at its Nagoya facility in order to meet the delivery timetable.

Mitsubishi last announced a programme delay in August 2013, when it pushed its first



flight from the third quarter of 2013 to the second quarter of 2015, and its first delivery from the summer of 2015 to the second quarter of 2017.

Last month the company announced high level management changes, including the retirement of its chairman and president.

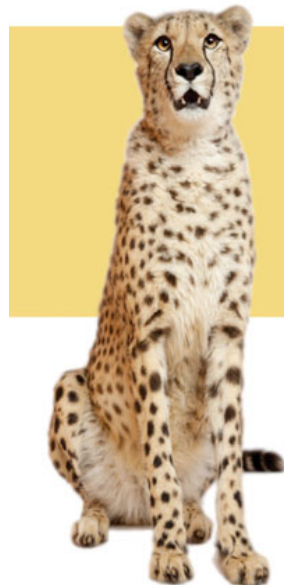
The new production base draws heavily on the capabilities of parent company Mitsubishi Heavy Industries (MHI), says the manufacturer.

The new MRJ factory is being constructed next to Nagoya Airport, and will be used to perform

final assembly, outfitting, and painting. Meanwhile, MHI's Kobe Shipyard & Machinery Works will "integrally produce" parts for the aircraft's wings. These will then be transported to Nagoya Aerospace Systems Works' Tobishima factory for fabrication on a dedicated assembly line, now under construction.

Final assembly of the aircraft's Pratt & Whitney PW1200G engines will take place at MHI Aero Engines.

Flightglobal's Ascend Fleets database shows there are 223 firm orders for the MRJ. ■



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REVIEW

USAF approval sought for SDB II production run

Raytheon has carried out three final programme reviews of its Small Diameter Bomb (SDB) II, ahead of a production decision the US Air Force is expected to make in May.

The company completed a functional configuration audit on the SDB II at its Tucson site in Arizona in early April, along with a production readiness review and a systems verification review.

"Raytheon has fully tested SDB II and verified that we meet or exceed the requirements necessary for a Lot 1 production decision," says Raytheon Missile Systems programme director Jim Sweetman. Once a decision is made, the system will enter low-rate initial production and a period of "government confidence testing". Operational testing with the tri-mode seeker-equipped design will begin next year.

The USAF and Raytheon announced in February that they had conducted live firing tests of the weapon from a Boeing F-15E, involving releases made against moving ground targets. Each Strike Eagle could carry a maximum of 28 SDB IIs. ■

WEAPONS BETH STEVENSON LONDON

Rocket trials bang on target as Tiger tests killer instinct

BAE's laser-guided APKWS scores perfect 10 during airborne campaign with Australian Army

The Australian Defence Force has conducted live firing tests of BAE Systems' Advanced Precision Kill Weapon System (APKWS) from its Airbus Helicopters Tiger rotorcraft.

Testing with aircraft from the Australian Army's 16 Aviation Brigade for the first time involved using APKWS to convert a Forges de Zeebrugge (FZ) unguided rocket into a laser-guided weapon. Performed near Darwin in the Northern Territory last November, the live trials saw the combination score 10 hits from 10 firings, BAE announced on 13 April. The campaign followed ground testing of the system at the Woomera test range in South Australia in August 2014, during which seven target hits were recorded from seven shots.

Conducted in "extreme heat conditions" at ranges of 0.8-2.4nm (1.5-4.4km), an altitude of 200-1,500ft and at speeds up to 140kt (259km/h), all airborne shots hit their targets within 1m of the laser spot, BAE says. "We showed up, never having utilised



Firings were performed from a maximum range of 2.4nm

that warhead and motor before, and we went 10-for-10," says Dave Harrold, the company's precision guidance solutions product line director.

Conversations with the Australian Department of Defence are continuing, he says, specifically surrounding how a purchase could be achieved.

A joint-service buy could be a possibility, with the Royal Australian Navy having shown interest in potentially using APKWS on its Lockheed Martin/Sikorsky MH-60R maritime helicopters. Navy officials were also present for the recent testing.

Additional nations that have FZ inventories could also be targeted, BAE believes, with the design also carried by Tigers operated by France, Germany and Spain.

Meanwhile, Harrold says the US Army should begin using APKWS on its Boeing AH-64 Apache attack helicopters "in the first half of this year", and that this will position the company to pursue opportunities with other operators of the Apache. Additional testing of the precision-guided weapon involving US Air Force Lockheed Martin F-16s is also expected to take place during 2015, he adds. ■

TRANSPORTS GREG WALDRON SINGAPORE

Canberra completes deal to add two more C-17s

Australia has confirmed it will acquire two more Boeing C-17 strategic transports for its air force, in a move that will increase the service's fleet of the type to eight aircraft.

"The two additional C-17s will provide vital heavy airlift support to a range of regional and global coalition operations and greatly increase Australia's capacity to provide rapid and effective disaster rescue and relief and humanitarian aid," the air force said on 10 April.

The acquisition is valued at A\$1 billion (\$758 million), with A\$300 million of this sum to be



The sale reduces Boeing's 'white-tail' stock of the type to five

spent on upgrading facilities at the Royal Australian Air Force's Amberley base in Queensland, including the construction of a new maintenance hangar for the 36 Sqn-operated airlifter.

In October 2014 then-defence minister David Johnston said Canberra was interested in buying between two and four additional C-17s, with the US Defense Security Cooperation Agency the

following month having valued a sale as being worth up to \$1.6 billion.

Boeing says confirmation of the new Australian deal reduces its stock of 'white-tail' C-17s to five aircraft. Production of the model will conclude later this year, with the programme's 279th and final example having entered final major join in Long Beach, California in late February.

Of a final 10 aircraft built without confirmed customers, the manufacturer had already finalised deals to sell one to Canada and two to an operator in the Middle East. ■



Catalogue of errors
led to Mi-17 crash
DEFENCE P18

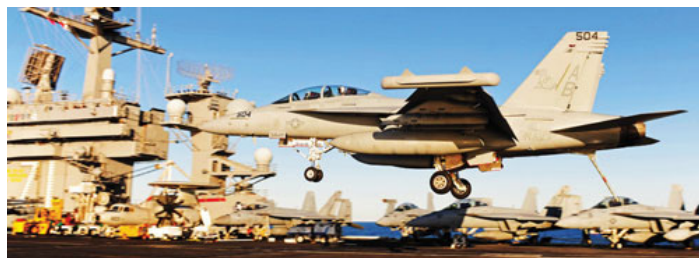
TECHNOLOGY STEPHEN TRIMBLE WASHINGTON DC

Growlers test passive targeting ability

Boeing developed the EA-18G Growler mainly to jam radars, but the US Navy has also been quietly developing its on-board systems to perform a critical new role in enabling attacks on surface vessels.

A formation of three EA-18Gs has demonstrated the ability to precisely determine the location of a target from dozens of miles away without using radar, says John Thompson, director of electronic attack for Northrop Grumman. This relied on using the company's ALQ-218 receivers to pick up emissions from a target vessel.

Each of the three aircraft will detect the signal at a slightly different time. Using a processing technique called time difference of arrival, computers can calculate a weapons-quality geolocation by measuring those tiny differences in timing.



A trio of EA-18Gs in formation can pinpoint a target without radar

As the EA-18G's existing datalink is not fast enough to share signal information between the aircraft, the type will use Rockwell Collins' wideband tactical targeting network technology.

The capability means a formation of Growlers can discretely find a target from stand-off range without giving their own positions away by transmitting radar signals. In the past, similar receivers have been used to detect targets using processing techniques such as long baseline in-

terferometry, but these were not accurate enough to precisely locate the source of the emitter.

Thompson says the USN first demonstrated the new technique during a live experiment in 2013, and that an improved version of the capability will be tested during the FLEX 2015 fleet experiment. The navy wants the system initially focused for use against surface vessels, but Thompson says it could be expanded to other types of ground or air targets. ■

AVIONICS

Gripen powers Skyward with Selex contract

Selix ES has been awarded a contract to produce Skyward-G infrared search and track systems for the Swedish air force's future fleet of 60 Gripen E fighters, with the work to be performed at its Nerviano site near Milan, Italy.

Also expected to be installed in Gripen NGs being acquired for the Brazilian air force, the electro-optical sensor will be mounted in front of the Gripen's cockpit to provide a passive, long-range detection capability against airborne, maritime and ground threats.

Saab is scheduled to deliver its first of the new-generation combat aircraft during 2019. ■



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MODIFICATION STEPHEN TRIMBLE WASHINGTON DC

US Navy drafts Osprey upgrade plans

Mid-life enhancements could mean wing and nacelle changes for tiltrotor as decision on possible engine switch looms

The US Navy is drawing up plans for a mid-life upgrade (MLU) of the Bell Boeing V-22 Osprey that could lead to major structural and electronic changes for the tiltrotor aircraft.

Discussions around the upgrade are separate from an ongoing effort to consider alternatives to the Rolls-Royce AE1107C

Liberty engine, says Col Dan Robinson, V-22 programme manager for the US Naval Air Systems Command.

The MLU activity will begin as the first V-22s reach about 5,000 flight hours some time in the next decade. The current highest-time aircraft – a US Air Force CV-22 – is already beyond the 3,000h mark.

"It may be a complete structural change of the wing and the nacelles," Robinson says of the intended upgrades. Speaking at the Navy League exposition in Washington DC, he also mentioned potential electrical and wiring improvements, along with replacement for obsolete components or materials.

The plan is part of a host of future upgrades coming for a V-22 fleet boosted by a recent USN decision that, once combined with foreign orders, should extend production of the Osprey well beyond 2020.

In January, the USN announced that a new version of the V-22 will replace the Northrop C-2 Greyhound in the carrier onboard delivery role. The service will buy at least 48 of the aircraft after the current multi-year procurement (MYP) deal expires at the end of

fiscal year 2017. A third multi-year deal will include orders by the USN and Marine Corps and also the Japanese military, which has so far ordered five of an eventual 17 of the tiltrotors.

Robinson says he also is "optimistic" about signing a six-aircraft deal with Israel in the near future. A contract was nearly signed last December, but was put on hold due to Israeli elections.

Meanwhile, the USN is continuing to consider engine alternatives as the programme begins negotiations over the third MYP deal, Robinson says. The US Marine Corps has previously considered the GE Aviation GE38, allowing its transport fleet to consolidate to a common engine also used by the Sikorsky CH-53K.

"It's just prudent to look at what engines are out there," Robinson says. ■



The V-22 has been selected for the carrier onboard delivery role

INQUIRY IGOR SALINGER BELGRADE

Catalogue of errors led to Mi-17 crash

Investigation finds pilot stress and lack of regulations, training and equipment contributed to Serbian medevac accident

Human error, bad weather and a lack of compliance with operational procedures were the main causes of a fatal accident involving a Serbian air force Mil Mi-17 transport helicopter last month, a service investigation has concluded.

Assigned to the 204th air force brigade/890th composite helicopter squadron, the rotorcraft was performing a medical evacuation mission near Belgrade Nikola Tesla International airport when it crashed, killing all seven people on board.

Errors by the crew have been given as the main cause of the accident, with contributory factors having included bad weather and flight planning inaccuracies.

An air force commission report also points to insufficient pilot training, inadequate or below-standard operating procedures for helicopter emergency medical service flights, a lack of regulations for multicrew aircraft and



The transport helicopter hit the ground at 118kt, killing seven

work pressure on the search and rescue (SAR) team members. A lack of required flight and safety equipment "as per earlier requests" – such as night vision/forward-looking infrared equipment, hoists, helmets for Mi-8/17 crews and safety belts for flight engineers and passengers – was also highlighted.

Serbia's defence ministry says a request was received at 19:30 local time on 13 March to transport a critically-ill infant from Raška in the southwest of the

country to hospital. Instead of alerting the SAR unit at Batajnica air base in Belgrade via the ministry's operations centre and air force operations centre, defence minister Bratislav Gasic telephoned the wing commander at the base directly to request urgent medical transport.

The Mi-17 crew managed to collect the patient, despite severe weather and low cloud, having flown using visual flight rules at an altitude of 6,200ft. While returning, they were requested by

air traffic control to fly to the international airport, where ambulances and the nation's health minister were waiting, instead of landing at Batajnica or a military hospital in Belgrade as planned.

A first approach was missed by the pilot, while the second was affected by deteriorating weather conditions. At one point, ATC advised that the helicopter was directly above the runway, but later findings showed that it was still 985ft away from the threshold, 460ft above ground level and higher than the cloud base. When a climb was requested, the pilots lost orientation and crashed into the ground at an airspeed of 118kt (219km/h).

Flightglobal's Ascend Fleets database records the Serbian air force as now having one Mi-17 and six older Mi-8Ts in use. Following the publication of the report, the nation's prime minister announced plans for the acquisition of two more Mi-17/171s. ■

MODERNISATION CRAIG HOYLE LONDON

Turkish F-16 upgrade programme completed

The Turkish air force has received the last of 163 Lockheed Martin F-16C/Ds to have been upgraded with new avionics equipment and an expanded weapons capability.

Handed over at Turkish Aerospace Industries' (TAI) Ankara facility on 10 April, two-seat trainer 89-0044 was one of 147 Block 40/50-variant aircraft mod-

ernised by the company. The remaining 16 were updated by the air force's 1st Air Supply and Maintenance Centre Command as part of a deal signed by the nation's SSM procurement body in August 2009.

Flightglobal's MiliCAS database records the service as having a current active inventory of 188 F-16Cs and 57 F-16Ds, which



Trainer 89-0044 was one of 163 Block 40/50 aircraft updated

gives it the third-largest fleet of the type, following the US and Israeli air forces.

The final Turkish aircraft to complete the PO-III upgrade pro-

gramme was assembled by TAI in 1991, and is powered by a General Electric F110-100 turbofan engine. ■

See Turkey Special Report P26

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ABACE 2015



Gloomy skies and gusting winds overshadowed the Asian Business Aviation Conference & Exhibition in Shanghai, which was symbolic of the downturn currently facing the sector after years of strong growth. While the clouds eventually lifted, there was a lack of significant private jet orders at the event – and it is far from clear when Chinese buyers will resume their high spending of the past. Show report by Greg Waldron

COMPLETIONS

Comlux contemplates partnership

Comlux Group is exploring the possibility of partnering with a Chinese company to perform private jet cabin completions.

The partnership would primarily be aimed at completions for larger business jets – namely those produced by Airbus and Boeing – says Comlux executive vice-president Arnaud Martin.

Martin notes that Chinese buyers tend to focus on their aircraft's cabin amenities. A 10-year-old BBJ 737, for example, costs about \$40 million, or half the price of a new aircraft, and a series of relatively straightforward updates to the cabin, such as new lighting, flat screens

and wifi can give owners a fully modern experience. An updated aircraft also can be delivered faster than a newly-built one, he adds.

A privately-owned BBJ on show in the static line had its cabin upgraded by Comlux in 2013, and a company-owned ACJ319 was chartered by Airbus to appear at the event.

Martin says Chinese owners are only now learning the true costs of operating private jets, but are reluctant to charter out their aircraft to reduce costs. More owners will be open to charters as the market matures, he believes. ■

OUTLOOK

Big OEMs remain positive – despite slump in demand

Key players Bombardier and Gulfstream maintain prospects in China are good, even though austerity is affecting market

While China's most significant business aviation show of 2015 was notable mainly due to the absence of major order announcements from Chinese lessors and other buyers, manufacturers remain positive about the market's long-term prospects.

A handful of small deals were confirmed during the event, including one from Cessna for a Citation XLS+ and another for an undisclosed buyer of a Bombardier Global-series aircraft.

According to an official from one of the exhibiting companies, austerity measures under the leadership of Xi Jinping have greatly reduced the acquisition of private jets by wealthy individuals.

"In the past they have bought aircraft largely for face, although they are starting to realise the potential for private jets as business tools," the official says. "But in the current environment they are careful about being ostentatious."

This year's event contrasted sharply with the 2014 show, when leasing firms announced orders for several business aircraft – including Minsheng Financial Leasing's landmark order for up to 60 Gulfstreams.

An executive at Bombardier, which dominates the market in China along with Gulfstream, says the outlook is still rosy. The official notes that China has relatively few private jets for the size of its economy, as opposed to Europe and the USA. "The number of business jets is too low for GDP, which continues to grow."

Executives were also asked about the large number of business jets ordered by Chinese leasing firms in recent years. These bodies are perceived as competing for the same market as the original equipment manufacturers.

Bombardier and Gulfstream dismiss this proposition, with the former noting that the leasing firms offer airframers another avenue to reach customers.

Jeffrey Lowe, managing director of consulting firm Asian Sky Group, contends that the business jet charter market has collapsed under the Xi regime, mainly because the central government – which used to make up about half of the market – has ceased chartering aircraft.

"If you want to buy an airplane in China, this is a good time to be shopping," says Lowe. ■

COMMITMENTS

Orders take off for Cirrus Aircraft's SR piston single

Orders for 74 aircraft from Chinese customers were announced by Cirrus Aircraft, including 60 SR-series piston-engined aircraft for company distributor GDAT and eight from AviClub – which like Cirrus is a unit of the Aviation Industry Corporation of China (AVIC).

GDAT is also buying six single-engined SF50 private jets,

which will be used by Dragon Technology for tourist flights. Deliveries will take place over the next few years.

Scott Jiang, head of Cirrus's China business, estimates that there are about 100 of the company's aircraft currently flying in the country. Longer term, Cirrus wants to produce the SR series in Zhuhai. ■



The company estimates that 100 of its aircraft are flying in China



AIX 2015
SHOW REPORT P22

PROPOSAL

Boeing touts BBJ 737 combi concept

Business Jets president outlines potential applications for variant that combines forward cargo hold with passenger cabin

A passenger/combi version of the 737-700C is being explored, with the variant to resemble the C-40 Clipper in service with the US Navy, says Boeing Business Jets president David Longridge.

"The variant would be able to carry four tonnes of cargo in the forward cargo hold and maybe 70 people in the back," he says. However, he stresses that Boeing has not committed to developing a combi version of the BBJ 737, but is studying the possibility and wants to float it to the market.

Longridge lists several government and commercial applications for such a variant – for example delivering relief supplies or other sensitive cargo loaded using a large cargo door just behind the left-side forward door, while also carrying personnel in the back.

"Often times when you fly something somewhere, you need



Derivative would resemble C-40 model operated by the US Navy

to bring people along to either operate it, distribute it, or guard it," he notes. The variant could also be used for the medical evacuation mission.

Longridge believes that commercial applications could include transporting highly specific equipment and personnel for the

oil and gas industry. The automotive industry also has a requirement to fly prototype cars to remote destinations in total secrecy, and a combi aircraft would allow the vehicle to be transported along with a team of technicians.

The variant would be a niche product, and Boeing says its

launch depends entirely on customer demand. If the company decides to move forward, it could have a BBJ 737 Combi aircraft ready in two years.

Boeing has previously delivered four BBJs that can be converted between the cargo and passenger missions, but is not contemplating the combi concept for its other BBJ aircraft, which cover converted airliners such as the 747-8I, 777-300ER and 787.

Longridge, who became president of Boeing Business Jets in December 2014, says China remains a very strong market, despite current slowing demand. The company has added a field representative in the country, where 18 BBJ 737s are operational.

On a global basis, Longridge estimates that 40% of BBJs are operated by governments, 40% by private individuals and 20% by companies. ■

PROGRAMME

'No plan B' for joint venture between Embraer and AVIC on the Legacy 650

Embraer remains committed to its Harbin joint venture to assemble the Legacy 650, despite a challenging Chinese tax regime and tightening market.

President of Embraer China Guan Dongyuan says that the Brazilian airframer remains confident that China will eventually ease duties on imported aircraft components.

"There is a 3-8% duty on imported components, but we trust that the Chinese government will change these rules," says Guan. "How can Chinese companies produce aircraft locally if they have this situation?" Guan says the company "has no plan B" for the Harbin Embraer Aircraft Industry joint venture with the Aviation Industry Corporation of China (AVIC).

The Chinese line formerly made the EMB-145 regional jet, on which the Legacy 650 is based. So far, the factory has delivered two Legacy 650s to customers, and will complete a third example in May.

Industry sources have questioned the Harbin line's viability,

owing to relatively low production rates and softening demand for business jets in China.

Embraer had a strong presence at ABACE, with three of its aircraft in the static display. The trio included a Legacy 650, Lineage 1000E and a debut Chinese show appearance for the Legacy 500. ■



First-time visitors to the show included the Legacy 500 twinjet

PRODUCTION

Mooney mulls China factory

Mooney is exploring the addition of a production capability in China's Henan province to build its future M10 piston aircraft.

The company, owned by Chinese firm Meijing Group, is likely to have some form of production in China, but it is still assessing the degree of such activity that it will undertake in the market, says Peter Claeys, vice president of sales and marketing in the Greater China region. The company is exploring options ranging from building the aircraft using kits, to obtaining a local production certification, he adds.

The aircraft produced in China would be exclusively for sale in the nation and the Asia Pacific region. Aircraft destined for the US and European markets would continue to be built at the company's Kerrville, Texas factory. ■

AIX 2015

Hamburg's annual Aircraft Interiors Exhibition showcases everything from seats, galleys and lavatories to lighting, latches, carpets and in-flight entertainment and communications technology, with a parallel event dedicated to catering, services and amenities. This year's event attracted more than 14,000 visitors. Reporting by Alan Dron, Dominic Perry, Kerry Reals and Dan Thisdell



IFE

Galaxy shines in intelligent route to streaming

BAE Systems unveiled Indian start-up carrier Vistara as the launch customer for its new IntelliCabin in-flight entertainment (IFE) system.

The airline, a joint venture between Singapore Airlines and Tata Group, will install the system across all three cabin classes in its Airbus A320s.

IntelliCabin provides wireless streaming of preloaded IFE content to passengers' own personal electronic devices. Vistara's business-class passengers will be able to access the system using customised Samsung Galaxy Tab S tablets provided to them by the airline.

The system, featuring movies, television, magazines and games, will go live later this year. Until then, BAE Systems is providing Vistara's business-class passengers on flights with a sector length of over 2h with an interim solution in the form of customised Galaxy tablets containing selected pre-loaded content.

The tablet-driven IFE system is one part of BAE Systems' IntelliCabin integrated cabin management system, which also includes in-seat power, LED lighting and dimmable windows, all managed via a centralised attendant control panel or a crew hand-held device. ■

INFLIGHT WI-FI

Connectivity 'like steroids'

Airline brand value soars when customers enjoy 'seamless' service, says Panasonic

Panasonic Avionics expects to install its in-flight connectivity systems in nearly 12,000 narrowbody aircraft over the next 10 years, a forecast which points to explosive growth in onboard internet demand. That long-term outlook compares to just 700 aircraft in service today with Panasonic systems, says executive director sales and marketing Neil James, who is claiming a market share of nearly half.

Another 4,000 widebodies will be fitted out by Panasonic, he says, adding that the company's biggest challenge will be to develop enough installation and support capacity to handle growth.

That forecast comes as Panasonic announced at Aircraft Interiors that it has signed up China

Southern Airlines as launch customer for its eXO system for 54 Airbus A320s and A321s being delivered from early in 2016, with another 50 options.

The company is building a formidable array of onboard and mobile technologies

During the next decade, demand for in-flight connectivity is going to see Panasonic installing about half of its new systems as retrofits in existing aircraft and half as line-fits on newbuilds.

In the meanwhile, says James, Panasonic is busy devising the systems it will offer from 2020,

and he promises stunning performance as airlines begin to draw on the large array of options available now and in development. The company is building a formidable array of onboard and mobile technologies aimed at helping airlines create what James calls a "seamless" customer experience. For business and first class, he says, the goal is "to bring the aircraft experience into the lounge and the lounge experience into the aircraft".

But the company's key push in the short term is to be the natural support and maintenance choice of airlines, by taking 25% out of the cost of system maintenance, compared to doing it themselves.

The maintenance proposition is built around "65 and growing" service centres; for many airline customers, he says, major maintenance is carried out at home bases, but with rising pressure to keep aircraft in flying, service is being broken down into as little as 1hr chunks, which can be carried out in the field – ideally suited to IFE maintenance at a remote Panasonic stations.

Airlines, he says, see their values rise dramatically if they can be both cost efficient across their operations and build increasing brand value. "But add connectivity and everything is on steroids," he says. ■



Panasonic's Neil James: "Bring the lounge onto the flight"

SEATING PLANS

Airbus stretches economy for five-class configuration

New “budget” and “comfort” concepts help bridge the price gap to full-flat business

Airbus took the occasion of Aircraft Interiors to introduce a five-class cabin concept, which features three grades of economy to help airlines bridge the price gap to business and first.

According to cabins marketing vice-president Ingo Wuggetzer, now that long-haul business-class cabins almost exclusively feature fully flat seats, airlines should look at premium economy as a way to offer a product in the increasingly large price gap between business and economy. Airbus’s solution is to push premium economy up a grade and split the rest of economy into “comfort” and “budget” sections.

The idea, he says, dates to Airbus’s introduction at last year’s AIX of an 11-abreast concept for the A380 superjumbo. Since then, much analysis and customer consultation has led to the notion of that 11-seat configuration as “budget” economy, with a 10-across configuration for customers willing to pay a premium for “comfort” and rows of nine seats in “premium”, where personal space is enhanced by a wider, 19in (48cm) seat and 38in pitch.

The budget seats would be 17” wide, while in the comfort zone they grow to the 18in that Airbus



In A380 cabins, budget economy will mean 11-abreast seating

has been touting as a minimum, to ensure adjacent passengers don’t rub shoulders. Wuggetzer says that surveys of both passengers and airlines have shown seat width to be the number-one factor affecting choice of ticket class – with 18in seen as a “tipping point” for shoulder room that also increases the perception of leg room, giving more space for hip rotation and leg angle.

A five-class layout is possible in an A380 and four is easily achievable, he says, but Airbus isn’t expecting airlines to leap at those options. Rather, with a large range of possibilities available directly from Airbus, airlines should be able to find a combination that maximises revenue potential for their particular routes

and customer profile.

In other types, the new options are beginning to show; AirAsia X offers some budget economy seats in A330s. An 18in Recaro-made economy seat shown by Airbus at AIX will now be available as supplier-furnished equipment for line- or retro-fit on A320s, a gap previously satisfied by buyer-furnished options.

Separately, Airbus rolled out a flexible seating initiative for its widebody range, with the new A350 next in line for options similar to those seen on the Space-Flex concept for the A320 narrowbody. Modifications such as rearranging lavatories and replacing them with slimline units could make room for up to 18 extra seats, says Wuggetzer. ■

RESTRUCTURING

Thales pushes the big ‘C’ in connectivity

Thales unveiled at Aircraft Interiors its new face for in-flight entertainment and connectivity, Thales Inflyt Experience – the result of a rebranding and repositioning process kicked off by its 2014 acquisition of Live TV.

Chief executive Dominique Giannoni says the Live TV deal helped cement the company’s position as a player in the connectivity segment: “It is no longer IFE with a small ‘c’ on the end – we have a more balanced portfolio.”

Giannoni stresses that the revamped company is focused on passengers and airlines, and built on three technology pillars: the Avant touchscreen IFE system, FlytLive’s broadband and connectivity services and maintenance and repair organisation FlytCare.

Avant’s fourth-generation touchscreen units have so far been installed on aircraft from 15 carriers, with the system making its A350 debut on Qatar Airways’ fleet of the new Airbus twinjet. ■



Qatar selected Avant for A350

REORGANISATION

Stelia rocks the cradle for step up in comfort

Stelia, the interiors and aerostructures company formed at year-end by the merger of Airbus Group’s Sogerma and Aerolia businesses, made its exhibition debut at Aircraft Interiors.

Showing off its new Celeste seating concept for business and premium economy, head of cabin interior marketing Claire Nurcombe told *Flight International* that there was always some natural overlap between the two, par-

ticularly in composites, so the merger removes some duplication while giving the 6,000-plus-employee unit a stronger research and development presence.

She also says that as a more efficient operation, Stelia is in good position to exploit the natural industrial advantages that accrue to an in-house supplier over external vendors of so-called buyer furnished equipment.

An example today, she says, is

the strain on the supply chain that has been created by the moves by Airbus and Boeing to update their A330 and 777 models – now, with near-term aircraft delivery slots opening up as some customers hold off for the updated models, the lead time for aircraft can be shorter than for some seating options.

The Celeste seats feature a fixed-position seat-back and cushion that reclines by rocking

like a cradle within a rigid frame. As a result, reclining does not encroach on the personal space of the passenger behind and, says Nurcombe, the fixed-position seat provides better support for the lower back and legs than traditional reclining designs.

A 12in (30cm) touch screen – or 16in in the business version – is built into the frame, so it remains in position regardless of how the passenger ahead adjusts their seat. ■

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FINANCE LAURA MUELLER LONDON

ATR seeks backing for bigger deals

Turboprop manufacturer offers financing community a diversified range of options in effort to attract more investment

Franco-Italian turboprop manufacturer ATR is working to bundle aircraft financings into larger deals in order to attract more investors to its regional product line.

"While smaller deals may be more accessible for a wide range of investors and financiers, allow for a more diversified approach and are easier to place and market, such deals may not reach the volume and visibility needed to access the largest players," says ATR finance chief Giorgio Moreni. "We are currently exploring ways to overcome such hurdles, such as packaging several deliveries to meet certain minimum entry levels."

In an interview with Flightglobal, Moreni says this is particularly true where "access to capital markets is concerned". However, he sees "significant short-term potential" for ATR financings in the public markets. "Some of our lessors are already tapping capital markets to finance their ATR acquisitions together with other aircraft types," he says.

NON-RECOURSE

Last year, the asset-backed securitisation market generated its first-ever deal featuring turboprop aircraft, when investment firm Castllake – formerly known as TPG Credit – issued a \$516 million non-recourse deal. The financing, which included one ATR 42-500, three ATR 72-500s, a combined 36 Bombardier Dash 8-100/200/300s and two Q400s, was oversubscribed.

ATR also anticipates that the first export credit agency (ECA)-backed bond refinancing will come to market soon.

In 2013, Colombian flag carrier Avianca financed 15 ATR 72-600s with an ECA loan, in a deal which involved an option to "flip" the funding to ECA-backed bonds, at part of a refinancing, at a later date.

"The intent was to flip to bonds in the capital markets this year, but due to market conditions, the window has not materialised as expected," says Moreni.



Earlier this year, Thailand's Bangkok Airways closed a deal to secure an ATR 72-600 delivery

The refinancing could "potentially occur" in 2016, he adds.

Moreni also sees non-ECA capital markets financing opportunities for new aircraft and used portfolios, but mainly in the US market.

Turboprops have traditionally held their values better than other asset types, and this has resulted in a growing investor appetite for used aircraft in the last few years.

This investment thesis propelled Irish-based Elix Aviation Capital to emerge in 2013 with financial backing from Oaktree Capital Management to invest mostly in mid-life and older turboprops. Last year, the lessor purchased a mix of 25 ATR 42-320/500s and Dash 8-100/300s from Nordic Aviation Capital in a transaction valued at more than \$100 million. Sources say Oaktree has agreed to provide \$300 million in working capital for the development of the turboprop platform. Greek entrepreneur Antonis Simigdalas and ex-Olympic Air operating chief Thanos Pascalis have minority shareholdings in the company.

Another financing "challenge" ATR faces is timing, says Moreni.

"Often, the financing community tends to focus on a nine- to 12-month horizon but, with a very robust order backlog and new orders coming, ATR needs to be working at securing 2016 already today."

But Moreni sees new interest to invest in ATR as coming from various sources, including investment and hedge funds, sovereign wealth and pension funds, insurance companies and new lessors.

The manufacturer has already sourced and secured "virtually all" of its 2015 deliveries – a move that is "obviously very good, in terms of production and slot management", according to Moreni.

"With a robust order backlog and new orders coming, ATR needs to be working at securing 2016 already today"

GIORGIO MORENI
Chief financial officer, ATR

In 2014, ATR secured a "large and diverse spectrum of financing and leasing" transactions. ECA financing – directly or via lessors and/or through sale-and-leasebacks – remained strong among customers' preferred solutions. Although at approximately 30% of ATR's deliveries, ECA financing has "seen its weight decreasing" compared with the past.

Earlier this year, Thailand's Bangkok Airways closed financing of a new ATR 72-600 delivery

through an ECA-backed loan guaranteed by Coface. Credit Agricole CIB acted as mandated lead arranger, security trustee and facility agent in the transaction. In 2014, Singapore-based Transportation Partners closed a large European ECA financing with BNP Paribas for 10 ATR 72-600s on lease to Malindo Air and Wings Air, with the Development Bank of Japan and SMBC as lenders.

The falling level of ECA funding is due to the "high level of commercial financing" available in the market, says Moreni. "Such liquidity – which supported roughly 60% of our 2014 deliveries and which we expect to remain steady through 2015 – has flown to our airlines customers directly or through lessors, which, at 30% of 2014 deliveries, have taken an increasing role in our market."

Moreni acknowledges the value of ATR's traditional financing solutions, such as the ECAs, but says the manufacturer is "constantly" looking at new opportunities to "provide a wider, more diversified range of solutions" to its customers. "These include pre-delivery payments, initial spares provisioning and services financing and access to a broader range of new investors and financiers," he says. ■



To access more coverage about the aircraft finance sector, visit flightglobal.com/dashboard



WINDOW ON THE WORLD

Turkey's defence sector and airlines have a global vision, with local champion TAI bidding to become a major exporter and Istanbul emerging as an air transport hub

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Clockwise from top: TAI's T129 is targeted at overseas markets; business aviation has unfulfilled potential; Turkish Airlines and low-cost rival Pegasus are both growing fast



Two Hurkus A trainers have completed more than 165 flights, while development of the type continues for the Turkish air force

COVER STORY

Powering to success

Turkish Aerospace Industries has established itself as a domestic sector champion. Now it is ready to enter the battle for export sales

CRAIG HOYLE LONDON

Just over 40 years ago, the government in Ankara embarked on a venture that was intended to transform the Turkish military from being largely dependent on foreign-sourced weapon systems by creating a capable national defence industry.

Since being formed in June 1973 with the responsibility of becoming the nation's sector champion, the now Turkish Aerospace Industries (TAI) has swiftly grown its capabilities.

The process began with assembling some of the Turkish air force's Lockheed Martin F-16C/Ds; an activity which ran between 1986 and 2012. The company's involvement with the fighter has since continued, with the last of 163 upgraded examples having been returned to the service on 10 April.

TAI has also previously provided avionics enhancements and structural upgrades for the type for the air forces of Jordan and Pakistan, and believes that additional modifications could be made for its domestic customer and other users. "There is strong competition in the F-16 modernisation market, but we believe that there may be some [further] opportunities," it says.

Other examples of local assembly have included the Airbus CN235 medium transport, and the Airbus Helicopters AS532 utility helicopters which were acquired for the Turkish armed forces.

More recently, the company has gone further, through its development and production of the AgustaWestland AW129 Mangusta fuselage-derived T129 ATAK platform. Eight aircraft from an initial batch of nine A-model attack helicopters have been handed over to the Turkish army, and the first examples in a more capable T129B configuration will be transferred later this year. A firm order has been placed for 59 of the type, with Ankara also having options on a further 32.

Adapted to meet the requirements laid down by Turkey's SSM defence procurement body, the T129 has gained numerous Turkish-developed systems and weapons, plus new engines, transmission and tail rotor.

GROWING INTEREST

"[Roketsan] Mizrak anti-tank missiles and Cirit guided rockets are already integrated onto the T129, and qualification processes regarding those weapons are successfully ongoing," says TAI.

The company is already pushing to secure export orders, and refers to "a strong international interest from the Middle East, Gulf region and Asia". It has already exhibited the T129 at major air shows in Bahrain, Germany and the UK, and will be taking it to Paris in June. Poland is a key sales target this year, with a need to replace its Mil Mi-24s.

"We believe that the T129 ATAK is a perfect fit for Poland's requirements in terms of its unique capabilities and performance parameters," says the company, which will

display it at the Radom air show in August and the MSPO exhibition in Kielce the following month.

Meanwhile, the manufacturer is making preparations to begin assembling a tailored T-70 variant of Sikorsky's S-70 Black Hawk, as part of a 109-aircraft programme for the Turkish armed forces, police and forest service. This will also involve domestic engine producer TEL, avionics supplier Aselsan and gearbox provider Alp Aviation. With its part of the contract to come into effect later this year, TAI expects to hand over its first T-70s in 2020. It will promote the variant to potential buyers in areas like the Middle East, Gulf region and Asia.

"We believe the T129 ATAK is a perfect fit for Poland's programme requirements"

TURKISH AEROSPACE INDUSTRIES

At the same time, it is moving ahead with an ambitious project to produce an indigenous light utility helicopter in the 5t weight class, having started study work in June 2013.

The twin-engined design will be adapted for both military and civilian applications. TAI has 250 engineers working on the programme, which is now in its system requirements review phase, and has established a new rotary-wing technology centre, to foster co-operation with small and medium-sized enterprises and universities.

"There is already a potential market for up to 400 helicopters in Turkey, and we believe our indigenous light utility helicopter will have a strong global market share," it says.

Its new rotorcraft will follow the Hurkus »

» fixed-wing basic trainer out of development, with certification for the latter being sought from the European Aviation Safety Agency.

So far, a pair of Hurkus A trainers have completed more than 165 flights. “By the end of this year, we are planning to make the final flight tests with the EASA pilot to complete the flight test phase of the certification process,” the company says. Stress testing of the design has already concluded, and fatigue testing is about to start. An initial 15 aircraft have been ordered for the Turkish air force in a B-model configuration, with deliveries to commence during 2018.

“In the near future, Hurkus will be sold to countries requiring a modern and advanced trainer aircraft, and the reconnaissance/surveillance variant supported with weapon systems,” TAI believes.

Other current fixed-wing activities include an extensive avionics modernisation being made on the Turkish air force’s Lockheed C-130 tactical transports, with a first completed example having been returned to use.

“The privilege and prestige of being a partner in the F-35 programme is also important”

TURKISH AEROSPACE INDUSTRIES

TAI describes itself as being a “cradle-to-grave” industrial partner on the Airbus A400M, “in charge of challenging components from the centre-forward fuselage to emergency and paratroop doors, ailerons and spoilers to water/waste systems”. Turkey has introduced its first two of 10 of the new-generation type to date.

Another task has been the in-country conversion of three of the Turkish air force’s four Boeing 737 airborne early warning and control system aircraft.

Much current work and emphasis is placed on TAI’s involvement in the Lockheed F-35 programme, which includes being a single or

second-source supplier on multiple components, including the stealthy type’s centre fuselage, composite engine inlet ducts and metallic subassemblies. It also expects to be involved in providing in-service support for the 100 conventional take-off and landing F-35As to be operated by the Turkish air force – the first six are on order – and also for some other Joint Strike Fighter users in Europe.

“In addition to the revenue expected for the programme, the privilege and prestige of being an important partner in the programme are also considered to be important,” the company says.

Such experiences gained since the outset of the current TAI’s journey since 1984 will be of value as Turkey pursues its planned indigenous TFX fighter and TX trainer projects, which should deliver replacements for its current F-16 and Northrop T-38 fleets. But for now, the contractor declines to detail its activities linked to both efforts.

READY TO FLY

Meanwhile, next year will see the first delivery of an Anka unmanned air vehicle to the Turkish air force. A baseline A-model version has already completed qualification testing with the SSM, and an enhanced version of the unarmed type is the subject of a 10-unit launch order. A new Anka B variant also got airborne for the first time on 30 January.

“We have discussed Anka exports with several countries in the past, and are discussing with some others as of today,” says TAI. “We believe the first international sale should be expected soon.”

Other UAV activities being pursued by the company include a four-year project to develop and test an unmanned rotorcraft for operation from naval vessels.

A little over 30 years after it handed over its first locally-assembled F-16, TAI has achieved its ambition of becoming a “world brand aerospace company”. This label will become more firmly attached once it has secured its first export deals with products like the T129, Hurkus and Anka. ■

Turkish Airlines claims the distinction of flying to more countries than any other carrier



AIRLINES

Turkey at a crossroads

Led by its flag-carrier’s global hub strategy, the air transport sector is booming, but infrastructure still has a lot of catching up to do

MURDO MORRISON ISTANBUL

Arrive at Istanbul’s Atatürk International – all too often after passing time in a holding pattern over the city’s western reaches – and you get a clear impression of an infrastructure straining to accommodate the ambitions of Turkey’s aviation sector. The gateway to the country’s biggest metropolis does not have enough gates and aircraft frequently have to park on remote stands. Surrounded by housing and businesses, expanding the footprint of Europe’s fourth-busiest airport has proved tricky.

The reason is twofold. A decade of strong economic growth and the deregulation of its airline industry in the early 2000s has created a boom in air travel, from Istanbul and other cities. Meanwhile, partly state-owned flag carrier Turkish Airlines has taken on the Gulf carriers at their own game with a successful hub and spoke strategy based on Istanbul’s centuries-old favourable location at the crossroads of Europe and Asia. As a result, Turkey’s com-



Turkish Aerospace Industries

First flight of the long-endurance Anka B was performed on 30 January



name sportsmen, Turkish Airlines' emergence as one of the world's biggest airlines in recent years has been a bit more under the radar than the headline-grabbing prominence of the big three Gulf carriers. Turkish Airlines now claims the distinction of flying to more countries – 103 – than any other airline, and in 2015 aims to increase its capacity by 15% and passenger numbers to 63.2 million.

DOMESTIC NETWORK

Its fleet profile is different to the Gulf carriers too, with a larger proportion of narrowbodies, mainly because its many destinations in Europe and the former Soviet Union are within short-haul reach – of its 254 passenger airliners, 199 are narrowbodies. By the end of 2015, says the airline, its fleet will reach 293 aircraft, with 214 single-aisles and 68 widebodies. And unlike the Arabian airlines, it has a large domestic network, with around two-fifths of its passengers travelling within the country.

The airline's recent orders included 82 Airbus A320s and 35 options, as well as 70 Boeing 737s with a further 25 options – an order which includes up to 75 of the re-engined Max family. The carrier's fleet is split

roughly equally between Airbus and Boeing, with 91 A320-family aircraft and 35 A330s, together with 109 737s and 18 777-300ERs. Turkish also operates a small fleet of Airbus widebody cargo aircraft and three Embraer 170s.

Turkish Airlines' dominance and impressive growth has somewhat overshadowed the success of the country's other carriers since deregulation, particularly low-cost carrier Pegasus, which is waiting to see whether it

“The reason for our growth was that we started with the right model at the right airport”

SERTAC HAYBAT

Chief executive, Pegasus

wins new traffic rights to countries in the former Soviet Union, the Middle East and North Africa before deciding whether to exercise options on dozens of aircraft. The privately-owned carrier says it has long faced a struggle to be taken seriously by the government.

In December 2012, Pegasus placed what was then the largest airliner order in Turkish history for 75 Airbus A320neo family aircraft – 58 A320neos and 17 A321neos – plus 25 options. The first seven aircraft are due to start arriving in the second half of 2016, with deliveries continuing to 2023. Pegasus, which launched its expansion drive under new ownership 10 years ago, has a young fleet of 58 aircraft, 52 of which are Boeing 737-800s.

If the airline is cleared to launch enough new routes it will keep many of its current aircraft, as well as the new Airbuses, giving it a

mercial aviation fleet has grown from around 160 at deregulation to 431 today, while passenger numbers have trebled to 81 million. The country's airlines have 337 aircraft on order – 213 of them destined for Turkish Airlines. Although Turkey has a population of only 76 million – roughly comparable to Germany – its relatively late start in aviation and extensive catchment area have made it one of the industry's most lucrative markets in recent years.

The Turkish government is tackling the infrastructure lag with plans for what will eventually become the world's largest airport, catering for 150 million passengers per year. Construction work has already begun in an area of forest north of Istanbul. The first stage, capable of handling 80 million passengers – one-third more than current numbers at Atatürk – is due to open in late 2017. However, there is scepticism, given delays to other high-profile airport projects such as Berlin Brandenburg, that this schedule will be met.

DEMAND

After a doubling in the number of airports to 52 over the past decade, the government has also looked at building more to ensure that no citizen is more than 100km (62 miles) from one – a tall order considering the low population density in remote parts of this large country. But Istanbul is where the most pressing demand for capacity is; the city's only other airport, Sabiha Gökçen – on the Asian side of the Bosphorus and home to Turkey's second airline Pegasus – has also expanded rapidly. Despite an advertising campaign involving big



Sabiha Gökçen operates 24 hours



A new airport under construction north of Istanbul will handle 150 million passengers



Expanding the footprint of Europe's fourth-busiest airport – Atatürk – has proven tricky

fleet of as many as 127 aircraft by early next decade, chief executive Sertac Haybat tells *Flight International*. However, if it fails to be granted sufficient bilateral rights it will divest most of its existing aircraft and surrender its options, leaving it with 75 new Airbus narrowbodies in 2023. “This is the flexibility we have and where we need to be,” argues Haybat.

Since launching scheduled services in 2005 – its first 15 years were as a charter carrier – Pegasus has battled for rights to fly certain international routes governed by bilateral agreements. Its foreign presence has grown – it has 59 routes beyond Turkey.

However, Haybat maintains overseas opportunities are hard to come by. “We are trying to get into North Africa, the Middle East, the CIS, but there are many bilateral issues,” he says. “It’s a painful process, but we will keep fighting.”

In Europe, the situation is different. Liberal environments throughout most of the continent have allowed Pegasus to develop an extensive network – particularly in Germany. “We have Europe pretty much covered – except for a couple of countries we are not re-

Africa, and this limits us. All these bilaterals are being enjoyed by Turkish Airlines and there is no transparency over the process of how they are distributed between airlines.”

SUCCESS STORY

Establishing itself at Istanbul’s Sabiha Gökçen – then a barely-used, single-runway former military facility on the Asian side of the city – allowed Pegasus to grow almost by stealth. “At the beginning Turkish [Airlines] didn’t notice us. As we were flying [scheduled services] from Sabiha Gökçen, nobody believed we would be a success story,” he says.

Following liberalisation of the Turkish market, Pegasus, along with a number of other carriers, launched scheduled domestic services. “We were the fifth airline coming into the Turkish market. We had around 6% domestic share in our first year. Now it’s 28% to Turkish Airlines’ 53%,” he notes. The choice of airport was crucial to Pegasus’s success, he notes.

“The reason for our exceptional growth was that we started with the right model at the right airport. Sabiha Gökçen was deserted in 2005. Half of our launch campaign was to promote the airport.”

Divided by the Bosphorus, Istanbul is in effect two cities, with the Asian part comprising a catchment of 9 million people, he says. Such was Pegasus’s success in creating its new hub that Turkish Airlines two years ago established its own base at Sabiha Gökçen. Pegasus, says Haybat, now has a 65% share of traffic from the second Istanbul airport.

While it does not compete with Turkish Airlines on long-haul, Haybat insists Istanbul’s “strategic location” allows Pegasus “meaningful connections” to important population and business centres with its narrowbody fleet. “We can reach all European cities, all major Russian cities, most of central Asia, all of the Middle East and most of North Africa,” he says.

One of Sabiha Gökçen’s advantages is its 24-hour operation, says Haybat. This allows Pegasus to fly to the east during the night and in daytime to Europe, where night-time restrictions apply. A proposal to build a second runway at Sabiha Gökçen would give Pegasus room to expand, and means it would not have to consider relocating to Istanbul’s planned new third airport, he says.

With its European routes established, Pegasus’s main opportunity is now to the east. Whether its ambitions are realised – and its new aircraft join rather than replace the existing fleet – depends on the attitude of the government, says Haybat, an aviation veteran who has worked for Turkish Airlines and has an engineering degree from Manchester University in the UK.

“In an ideal world, we will be flying more to the Middle East, Russia and North Africa,” he says. ■

The Turkish government is tackling the infrastructure lag with what will become the world’s largest airport

stricted – so we will add more frequencies. This summer, for example, we are introducing six flights a week to [London] Gatwick,” says Haybat in an interview at the carrier’s modest headquarters near Sabiha Gökçen.

He adds: “It is not easy for us to grow internationally. On domestic, it is almost a liberal market, but Turkish Airlines dominates the bilaterals in the Middle East, Russia and North

Pegasus launched scheduled domestic services following the liberalisation of the Turkish market





The Turkish business jet fleet is relatively small, with just 120 aircraft on the register

BUSINESS AVIATION

Oiling the wheels

Investment in airports and sector-specific regulation will be required if the country's fledgling private aviation industry is to take off

MURDO MORRISON LONDON

Like many emerging economies with strong international trade and distant centres of population, Turkey has seen interest in business aviation soar in recent years. However, in common with similar countries, inadequate infrastructure and an immature regulatory environment is holding back the sector's growth.

"Turkey has really boomed in terms of business aviation demand in the last six or seven years," says Fabio Gamba, chief executive of the European Business Aviation Association, which in October 2013 held a conference in Istanbul to discuss ways of ensuring the industry became a "growth engine" for the Turkish economy.

Although Istanbul alone had 37 billionaires in 2013, according to Forbes – just behind London and Hong Kong on that index of wealth – the Turkish business jet fleet is relatively small, with just 120 aircraft on the register (not counting those operated by the armed forces and police) and a small number of ser-

vice providers, mostly based at Istanbul Atatürk, the country's main hub. "The sector is still in its infancy compared with the size of the economy," says Gamba.

The biggest problems identified by EBAA included access to ground infrastructure – mainly due to overcrowding at Atatürk, home to rapidly growing Turkish Airlines. With the country's focus over the past decade being the growth of its airline sector and attracting tourism, the absence of specific regulation for general aviation was seen as another hurdle.

Although not a challenge exclusive to business aviation, lack of capacity at Atatürk is a "huge drag" on the sector, says Gamba. Istanbul's only other airport is on the Asian side of the city, tens of kilometres from the financial

"Turkey has boomed in terms of business aviation demand in the last six or seven years"

FABIO GAMBA
Chief executive, EBAA

centre. "With Turkish Airlines doing so well, it is taking up the whole of the airport and business aviation is squeezed out. It is difficult to explain to someone who is paying a lot of money [for his business aircraft] that he can't fly when he wants to fly," he says.

Although the country's economy largely rode out the global crisis of 2009 and 2010, growth in Turkey's business aviation sector has dipped due largely to conflict in Syria and

Iraq, two of the country's biggest trading partners. "We are still not back to levels we were at three years ago," says Gamba.

However, he believes that the slump is temporary and "you will see a rebound – with one caveat, and that is infrastructure". Assuming Istanbul's third airport opens as planned by the turn of the decade, business aviation could at last, he says, be freed up to expand in line with the economy.

ANTICIPATION

Several business aviation concerns have set up operations in Turkey in anticipation of a growing fleet. They include Swiss maintenance and completions house AMAC which in 2012 opened a hangar at Atatürk to service Pilatus PC-12s. Last year, it added an authorised service station status for Dassault Falcon.

EA Aviation, an investor in the new Eclipse Aerospace, which relaunched Vern Raburn's Eclipse 500 very-light jet as the Eclipse 550 in 2010, represents the marque in the Middle East, North Africa and former Soviet Union and operates a service and upgrade facility for the region's 30 or so in-service Eclipse 500s at Atatürk airport. EA's founder, Ekim Alptekin, admits business aviation growth in Turkey is lagging that of commercial aviation. "We need to change awareness and improve infrastructure," he says. However, he maintains the Eclipse 550 will appeal to a new generation of entrepreneurs keen to fly themselves between appointments, both within Turkey itself and the 50 countries Alptekin says the aircraft can reach from Istanbul. ■

ISAE Supaero's programme uses a range of neural measurement techniques

IRRATIONAL BEHAVIOUR

A French research study aiming to understand and counter the mental processes that presage pilot error could change the way cockpit training is carried out

DAVID LEARMOUNT TOULOUSE

Pilots make mistakes. Mistakes are a product of the brain. If it were possible to identify the common neurological precursors for pilot errors, it might be possible to prevent them.

That, at least, is the theory on which the Institut Supérieur de l'Aéronautique et de l'Espace in Toulouse is working. Prof Frédéric Dehais, who holds the AXA chair of neuroergonomics for flight safety at ISAE Supaero, describes the research programme he is head-

ing as a merger of neuroscience, human factors and computer science.

A Boeing study quoted by Dehais shows that, between 2002 and 2011, 1,493 people died in some 50 in-flight loss-of-control or controlled flight into terrain accidents. "In the majority of these stressful but recoverable situations," he says, "it appeared the crews were unable to identify the problem, and continued to take irrational decisions that did not make sense according to what was happening." Even the intervention of audible alerts made no difference to the crew's persistence with a

doomed strategy. "Accident analysis reveals that the complexity of modern transport aircraft can overwhelm the most experienced crews when something goes wrong," Dehais says. "They can become confused, stressed, and fail to assess the criticality of the situation. They also persist in erroneous courses of action despite auditory and visual warnings in the cockpit. In the end, they crash."

He adds: "These dramatic events are surprising because the pilots are supposed to be highly trained. There is a need to understand what kind of neural mechanisms are leading to these situations."

UNDERLYING MECHANISMS

This programme uses a unique range of neural measurement techniques while putting pilots through flying tasks in a flight simulator. "The purpose of my research is to uncover the underlying neural mechanisms of human error that lead pilots to persist in irrational behaviours," Dehais says. Serious accidents may be rare, but 70% of them result from human error, so a deeper understanding of the nature of error and what causes it is an important objective.

"The complexity of modern aircraft can overwhelm the most experienced crews"

PROF FRÉDÉRIC DEHAIS
ISAE Supaero

"Our approach combines cutting-edge brain imaging, signal processing and artificial intelligence techniques as well as a unique methodology from basic protocols to ecological experiments," explains Dehais. "Results from this research will be strongly beneficial to aviation safety, leading to the implementation of innovative solutions to mitigate human error."

Tools used to monitor pilot reactions during flight simulator exercises – and real flights – include eye-tracking, measurement of pupil dilation, electro-encephalograms to track deep brain activity and infrared sensors that can show activity in critical surface brain areas, as well as advanced brain imaging and signal processing techniques. Pupil dilation is a reliable external indicator of mental stress, says Dehais, and there are now very precise ways to monitor it. The scientists can watch as a highly stressed pilot's brain literally shuts down many of its critical faculties and shifts from rational decision to emotional reaction. At that point the pilot is in a state of "inattention deafness", where audible alarms and spoken instructions are ignored.

More conventional physiological measurements are also used. The heart rate indicates

the levels of mental stress and physical workload. For example, a take-off in a simulator does not raise the heart rate to the degree it does in a real aircraft.

Wired-up pilots flying a real light aircraft are not forced to undergo an actual engine failure, but the throttle is pulled back and the pilot has to look for a forced landing opportunity. Meanwhile his or her brain activity is being measured and recorded so common neurological activity patterns can be identified and related to specific activities and stress levels.

All the same monitoring techniques can also be used for the pilots of remotely operated unmanned aerial systems.

Backed by the AXA Research Fund, the ISAE is working to identify the patterns of neurological activity that occur when pilots become confused, overloaded, or focused on non-critical inputs to the exclusion of critical ones. If one can identify and understand the neurological reaction, says Dehais, it is possible to apply what he calls “cognitive countermeasures”.

In the AXA-ISAE project, Dehais is working in parallel with research being carried out at NASA's Ames Research Center, Stanford and Harvard universities, the Centre for Information and Neural Networks in Japan, and Laval University in Canada.

OVERLOAD

Artificial intelligence may still be thought of as being in the realms of science fiction, but ISAE believes it may be used in the recognition of overload and the timely deployment of appropriate cognitive countermeasures.

Even factors such as “emotional bias” can be recognised. ISAE says this is caused by pressures from “outside the cockpit”, such as pilot perception of commercial pressure to land when a go-around would be wiser. The ISAE has tested the cognitive effect of emo-

tional bias by offering pilots a financial benefit to land versus a small financial penalty for a go-around, and have observed in their brain a greater degree of neurological stress during the decision-making process, because it is no longer a decision affected purely by operational considerations. The effects on brain activity of ambient light, fatigue and age can also be identified, as can the effectiveness of mitigating techniques for each of those.

The ISAE scientists can predict which tasks the pilot will no longer be able to perform as stress increases

Knowing, as neurologists now do, which parts of the brain control specific functions, the ISAE scientists can predict which tasks the pilot will no longer be able to perform as the stress increases.

There are traditional ways of helping pilots deal with stress. Good training and high levels of knowledge in a pilot mean that he or she is less stressed by any given situation than a pilot with poor training and knowledge, and the ISAE says this is visibly true. But the institute is looking beyond the traditional to what else will be effective.

This new level of neuroergonomic understanding promises to enable manufacturers to eliminate alerts and other stimuli that do not work, and develop completely new “cognitive countermeasures” designed to attract the attention of pilots whose cognitive capacity has been swamped. An example of such a system is a window appearing on the navigation display showing an animation of a pilot carrying out the required action to ensure recovery. Neurologists know that, when all else fails, they can invoke the human imitative function

– the one that makes a person yawn when someone else yawns.

Another “cognitive countermeasure” that the ISAE has found to be highly effective is, when a pilot is clearly focusing on one information source to the exclusion of other critical ones, to remove that information completely. The pilot's instrument panel scan immediately switches elsewhere looking for information to replace the removed data, and discovers important information he or she has been missing.

AUDIBLE ALERTS

Previous approaches to dealing with common mistakes have included multiplying the number of alerts, including audible or spoken alerts. ISAE explains that, beyond a certain point, this can be at best pointless and at worst counterproductive, increasing stress and narrowing a pilot's focus further.

So it makes sense to understand what happens to pilots' cognitive functions when they are stressed.

Neuroergonomics has enormous potential. It could be used during the pilot selection process, and also for monitoring the effectiveness of training techniques or of different cockpit designs. The ability to identify “emotional bias” could eliminate speculation about whether pilots who work for airlines that require them to be self-employed and paid by the hour are under more stress than pilots with a salary and incentives. The accuracy of the observations is such that it might be able to indicate the kind of mistakes pilots under emotional stress are more likely to make.

Dehais points out that the ISAE research has applications to other people who work in high stress, safety-critical jobs, such as those at the front line in nuclear power control.

Whatever else the ISAE's continuing research discovers, this project has huge potential to advance mankind's understanding of aviation human factors. ■



Tools used to monitor pilots during simulator exercises – and real flights – include eye-tracking and electro-encephalograms to track brain activity

R-R's Trent XWB is the sole selection on the A350 XWB, following on the success of the A330 Trents



POWER SHARING

CFM still dominates, but the civil engines market is very different to a decade ago. We take a delve behind the data

MAX KINGSLEY-JONES LONDON
ANALYSIS BY **ANTOINE FAFARD**
FLIGHTGLOBAL INSIGHT

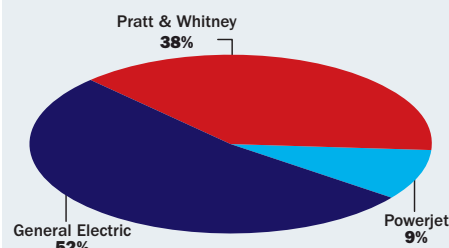
Powerplants are central to key airframe developments in air transport as the tempo rises around the re-engined narrowbody sector, and as manufacturers battle for share.

Our annual analysis of market trends using Flightglobal's Ascend Fleets database highlights how CFM International still wears the crown as the industry's leading supplier. But the renaissance at Pratt & Whitney continues



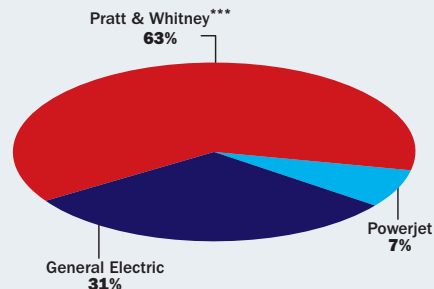
REGIONAL AIRCRAFT ENGINE MANUFACTURER MARKET SHARE

2014 deliveries*



Total deliveries: 276

Backlog**



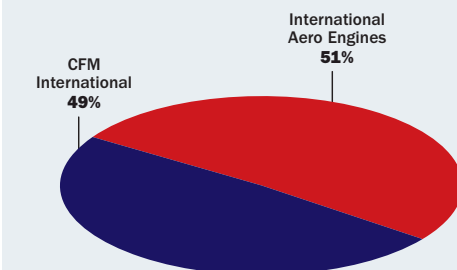
Total backlog: 1,534

NOTES: *Airframe. **At 31 December 2014. Excludes corporate and military operators. ***Including P&W Canada. Data for firm orders for ATR, Bombardier (including CSeries), Comac, Embraer, Mitsubishi and Sukhoi.

SOURCE: Flightglobal Insight analysis using Ascend Fleets database

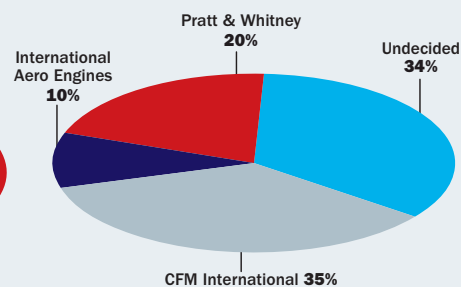
A320 FAMILY – ENGINE MANUFACTURER SHARE

2014 deliveries



Total deliveries: 485

Backlog*



Total backlog: 5,126

NOTES: *At 31 December 2014. Excludes corporate and military operators.

SOURCE: Flightglobal Insight analysis using Ascend Fleets database

ENGINE MANUFACTURER RANKING

Rank	Manufacturer	2014 deliveries		Backlog*	
		Engines	Share	Engines	Share
1	CFM International	1,412	51%	12,178	49%
2	International Aero Engines	496	18%	1,060	4%
3	General Electric	452	16%	2,290	9%
4	Rolls-Royce	282	10%	2,704	11%
5	Engine Alliance	84	3%	224	1%
6	Pratt & Whitney	20	1%	2,108	9%
	Undecided			4,086	17%
Total		2,746		24,650	

NOTES: *At 31 December 2014. Data for installed engines based on Airbus/Boeing types. Excludes corporate and military operators.

SOURCE: Flightglobal Insight analysis using Ascend Fleets database

as it rebuilds its market share in the single-aisle sector through its successful geared turbofan, the PW1000G. The engine is an option on the Airbus A320neo, and the only powerplant on the Bombardier CSeries, Mitsubishi MRJ and Embraer E-Jet E2.

In 2014, Airbus and Boeing between them produced a record 1,324 commercial airliners, up 6% on the year before. This resulted in 2,746 installed engines being shipped by CFM, P&W, Rolls-Royce, International Aero Engines and Engine Alliance. The powerplant order backlog (based on installed units) at the end of last year stood at 24,650 engines.

CFM accounted for just over half of all the installed engines delivered to commercial operators on mainline airliners during 2014, with a total of 1,412 units. It has a similar share of the backlog, with its total standing at almost 12,200 units, which represents 49% of all outstanding orders.

NARROW ARENA

CFM's strong performance in shipments is driven by its exclusive supply deal on the Boeing 737, and the fact that it just beat rival IAE, on the A320 family. The single-aisle sector is where the big battle is playing out, as the

PW1000G slugs it out with CFM's new Leap engine on the A320 family. But again, CFM is exclusive on the 737.

P&W holds 20% of the A320 family sector, and combined with IAE's 10% (in which P&W has a 49.5% stake), its share grows to 30%. CFM is still ahead, with 35%, although there is a similar amount still to play for.

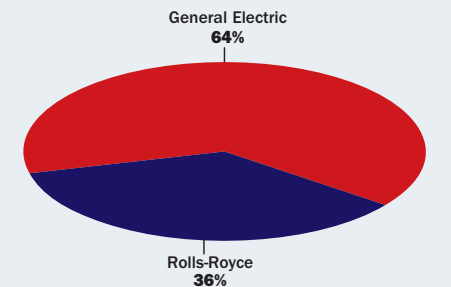
The other key market in the engine competition stakes is around the Boeing 787. Here, CFM's 50% shareholder GE competes with R-R and holds the advantage. Its GENx turbofan powered 64% of the 111 787s delivered to airlines in 2014, and the engine has



CFM's Leap is exclusive on the 737 Max

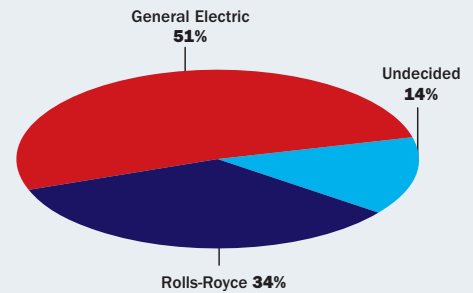
787 – ENGINE MANUFACTURER SHARE

2014 deliveries



Total deliveries: 111

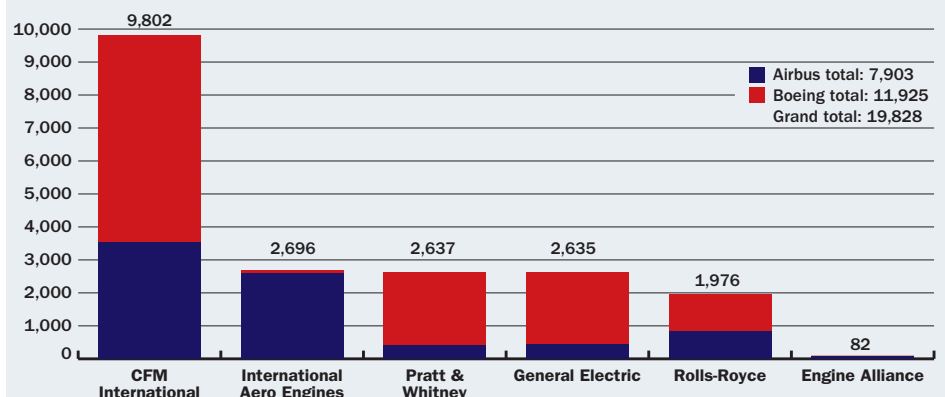
Backlog*



Total backlog: 835

NOTES: *At 31 December 2014. Excludes corporate and military operators.
SOURCE: Flightglobal Insight analysis using Ascend Fleets database

AIRBUS/BOEING FLEET BY ENGINE MANUFACTURER



NOTES: In-service & parked fleet at 31 December 2014. Boeing includes former MDC types. Excludes corporate and military operators.
SOURCE: Flightglobal Insight analysis using Ascend Fleets database

767 ENGINE MANUFACTURER SHARE

Manufacturer	2014 deliveries		Backlog*	
	Aircraft	Share	Aircraft	Share
General Electric	5	83%	43	100%
Pratt & Whitney	1	17%	0	-
Total	6		43	

NOTES: *At 31 December 2014. Excludes corporate and military operators. SOURCE: Flightglobal Insight analysis using Ascend Fleets database

A330 ENGINE MANUFACTURER SHARE

Manufacturer	2014 deliveries		Backlog*	
	Aircraft	Share	Aircraft	Share
General Electric	14	13%	45	15%
Pratt & Whitney	9	9%	27	9%
Rolls-Royce	82	78%	228	75%
Undecided	-	-	4	1%
Total	105		304	

NOTES: *At 31 December 2014. Excludes corporate and military operators. SOURCE: Flightglobal Insight analysis using Ascend Fleets database



P&W continues to rebuild share on A320neo

A380 ENGINE MANUFACTURER SHARE

Manufacturer	2014 deliveries		Backlog*	
	Aircraft	Share	Aircraft	Share
Engine Alliance	21	70%	56	34%
Rolls-Royce	9	30%	29	18%
Undecided	-	-	80	48%
Total	30		165	

NOTES: *At 31 December 2014. Excludes corporate and military operators. SOURCE: Flightglobal Insight analysis using Ascend Fleets database

» captured slightly more than half the backlog. R-R has around a third of the outstanding orders, with 14% of the backlog still up for grabs.

R-R is in a much stronger position on the Airbus A330, where it was already winning the three-way fight with GE and P&W before securing an exclusive supply deal on the A330neo last year. In 2014, R-R Trents powered 78% of the A330s delivered, and the UK company holds a 75% share of the backlog.

Engine Alliance is ahead of R-R on the A380 – largely thanks to its success with the biggest customer Emirates. The GP7200 powered 70% of the A380s delivered last year and has been selected to power 34% of

the backlog. Almost half the 165 A380s on backlog are still subject to an engine choice, but the bulk of these orders are for Emirates, where a selection awaits the outcome of Airbus's decision on whether to launch a re-engined version.

FRONTRUNNER

Unsurprisingly, CFM's market domination extends to the current mainline airliner fleet, where its engines power half of the 19,800 Airbus and Boeings in service (or in temporary storage) with airlines. Boeing 737s account for two-thirds of the CFM fleet.

IAE, P&W and GE all power a similar number of aircraft, with each fleet in the 2,600-

2,700 units band. R-R is next, powering just under 2,000 aircraft.

In the regional sector, GE is the lead supplier thanks to its prime position on the Bombardier CRJ and Embraer E-Jet. The US company powered 52% of the 276 regional airliner deliveries last year.

P&W has always had a strong presence in the sector through the turboprop engines produced by its Canadian arm, and powered 38% of the deliveries last year. However, the success of P&W's GTF on the new-generation regional types has propelled it into the lead in terms of backlog. The PW1000G-powered types account for 63% of the 1,534 regional aircraft on order. ■

From yuckspeak to tales of yore, send your offcuts to murdo.morrison@flightglobal.com

Kidman's Etihad ad 'just not fair'

Americans for Fair Skies – the “grassroots” group lobbying to ban the big Gulf carriers from the USA because of the state subsidies they allegedly receive – has accused Nicole Kidman of having her eyes wide shut.

The reason: the Hollywood star's role in an Etihad advert, where she stretches her legs in the airline's rather appealing private first class suites.

It follows a *Wall Street Journal* claim that Etihad flight attendants are forced to live in “confinement” in secure compounds. AfFS is backing a call by the Association of Professional Flight Attendants for Kidman – a UN Women's Goodwill Ambassador – to end her relationship with Etihad, describing her endorsement of an airline “well known for its discriminatory practices towards those it employs to be both puzzling and unsettling”.

While the UAE is far from perfect, the claims may come as some surprise to the hundreds of young flight attendants who live in well-appointed, company-provided apartments in Abu Dhabi, free to come and go and travel the world on staff discount flights. They remain guests in the country under contract to their employer, of course – but that is a sacrifice made by all expats enjoying the rewards of working abroad.



You're even allowed to put your feet on the seats

After earlier dark references by one airline boss to the fact that several of the 9/11 terrorists were citizens of one of the countries accused of providing subsidies, we wonder if there is any mud left that Americans for Fair Skies – or Americans for Sky-High Fares as it has been unkindly dubbed – is unwilling to sling.

Water way to go

More than a century after one of the first amphibious aircraft – the Waterbird – took to the air over Lake Windermere in the UK's Lake District, enthusiasts hope this September to re-enact the moment by constructing and flying a replica.

Capt Edward Wakefield, an army officer, landowner and barrister, had set out to prove that it was possible for an aircraft to take off from and land on water – thus avoiding the potential damage heavy landings caused to early, frail airframes.

Although his vision was ridiculed, he achieved his dream in his AV Roe-built aircraft in November 1911, months after Glenn Curtiss in the USA had achieved a similar feat – his breakthrough featuring on the cover of this magazine at the time.

Although it still has to raise about half the £160,000 required

to bring the replica to flight, Lakes Flying Company is convinced it can get airborne on its 17 September target date.

More at waterbird.org.uk

Going viral

A press release arrives with an extract from a speech which begins: “It is indeed a privilege for me to unveil this plague...” From the Four Horsemen of the Apocalypse perhaps?

Running short

Ethiopian Airlines is offering special fares for runners in Ghana's Millennium Marathon this September, which the carrier says is “anticipated to be one of the fastest marathons in Africa”. It also adds that the race is only 21km, which might explain why.

Crash decision

John Mountfield sends this snap taken at his local airfield. “Not my first choice of registration,” he remarks.



Keeping mum

Our readers will appreciate that many new departures in

100 YEARS AGO

construction or advances in detail work are necessarily held

back for the present rather than the smallest risk should be run of helping those who are so strenuously fighting the Allies for the enforcement of their “Kultured” militarism.

Paper planes

Further drastic rationing of paper supplies by the

75 YEARS AGO

Government in consequence of the extension of the war to

Scandinavia and partial cessation of imports, means that paper must be conserved in every possible way. It is thus imperative for readers who wish to avoid disappointment to request a regular copy of *Flight*.

Supersonic dream

The Boeing SST could operate easily from today's airports.

50 YEARS AGO

Its takeoff and landing characteristics would, in fact, be

even better than those of today's long-range jetliners. It could be in commercial service in the early 1970s.

The wrath of Satan

The Soviet Union is likely to deploy a new variant of the

25 YEARS AGO

SS-18 “Satan” intercontinental ballistic missile

later this year. All variants of the SS-18 Satan missile, including the MIRVed Mod 2, 4 and 5, are seen as “hard kill” weapons designed for counter-force operations.

FG

100-YEAR ARCHIVE

Every issue of *Flight* from 1909 onwards

can be viewed online at

flightglobal.com/archive



Flight was big news at the time

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Without ETOPS, we'd be on ships

I laughed out loud when I read Tim Seabrook's letter (*Flight International*, 31 March-3 April) with his prediction that MH370 would mean the end of ETOPS.

His whole premise about what happened to MH370 seems to have been pulled out of thin air. For example, the idea of "unregulated intermittently switching power sources causing spurious data to be sent".

Even a non-technical understanding of the press reports revealed that the Inmarsat messages were timed to determine where they were sent from. Plus, they were received on regular intervals (not randomly) and the messages didn't even contain positional information.

All of his assertions are typical conspiracy theorist conclusions. It seems that Mr Seabrook has something against ETOPS and is searching hard for some contrived reason why ETOPS must go away. Why? I can't imagine. Maybe he prefers to cross the ocean using a sailboat?

Sunil Gupta
Maryland, USA

AIRCRAFT LOSS

Did MH370 suffer on-board fire?

Malaysia flight MH370 gave a curtailed ATC sign-off at 01:19 Malaysian time, dropped off military radar at 02:22, was declared missing at 06:32 and made a final satcom log-on at 08:19. One version of events says it flew high, fast and straight into the southern Indian Ocean.

But as noted in my last letter (*Flight International*, 3-9 March), a witness saw an aircraft around 03:00 that might have suffered burn-through of the lower hull between the engines. The factual information report says 221kg of lithium-ion batteries and 2,250kg of books were stowed in that location.

Two further claimed sightings of an aircraft in distress have been drawn to my attention. As with other local reports they are second-hand, and require thorough review, but suggest an aircraft passed south of Banda Aceh and east into the Malacca Strait, possibly with a renewed intention to land if conditions permitted.

So an alternative history would tell of a catastrophic fire, a turn-back, an emergency descent at 02:22, another reversal to an easterly heading and continued low, slow, flight under limited control.

A speed up to 300kt (556km/h) would be compatible with the Inmarsat "ping rings". When the search began, there was doubt whether MH370 was still airborne at 02:00, let alone 08:00, and certainly not over a populated area covered by radar.

Nonetheless, the investigation could have done more to seek and engage with eye-witnesses, to search the radar tracks from the daylight hours and comb the beaches for flotsam.

Richard Lloyd
Coventry, UK

Fuel the debate

Tim Seabrook's conspiracy theory seems a little short on fact, such as the circumstances of MH370 are known.

There is a 585 page document, freely available to those who would search for it, promulgated by the Annex 13 Malaysian investigation team that goes into huge detail about everything that is known about this flight.

At the last ACARS position report transmission at 17:07:29 UTC on 7 March, the fuel remaining was 43,800kg (96,600lb) at 35,000ft with a SAT of -44°C (-47°F) and wind of about 070/15.

The aircraft crossed IGARI at 17:21 and, to be very brief, was lost to all contact except possibly

military radar. The track appeared to settle on 231° magnetic. The altitude did appear to vary for a while.

As the tracking remained constant it would seem to indicate that the lateral navigation of the aircraft was under control.

If, as Mr Seabrook suggests, there was an engine failure and subsequent depressurisation with a turn back towards Malaysian airfields and an emergency descent, it is my contention that the crew would have been embarrassed by too much fuel for an east coast landing.

Even if they had continued towards KLIA (departure airfield) at 10,000ft on one engine, they would probably have had to jettison fuel to reduce to maximum

landing weight. The conspiracy theory simply doesn't hold weight. We need a 777-200ER team to join in here.

Martyn Apperly
Ex BOAC/BA and EasyJet
By email

Sore seats

The new British Airways Airbus A320 series seats are very constricting, even when in a club area. In my case that means legs out sideways!

Worse though is the fact that they are hard, front and back. I tested this the other day and leaned forward as far as I could. My forehead came perfectly on to the jutting-out piece just above the table latch.

If the pilot were to execute an emergency stop (and we all know how immediately aircraft can stop) I could imagine at best a really painful wound to the head, at worst perhaps something more serious. Happy comfort of the old 737-400s!

John Wallinger
Upton Grey, UK

Risk of stress

Regarding Germanwings. Stress has always been there among pilots, and now someone has gone over the edge. It is truly awful.

But, perhaps we should be looking at the condition of those who have had their pensions severely reduced after their airline has been taken over by a new investment outfit that did not want to take on pension liability, and the previous owners also do not want to accept this obligation.

I think this is also a very real potential safety risk.

How would you feel in that situation? My pension is everything after 40 years.

Name address withheld



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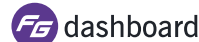
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flightglobalevents.com/
loyaltyfreddies2015

1-3 May

Drones, Data X conference
Santa Cruz, California
nua.io

4-7 May

AUVSI's Unmanned Systems
Atlanta, USA
auvshow.org

10-11 May

Aviation Africa
Dubai, UAE
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13-14 May

Ascend Asia: Finance Forum
Singapore
flightglobalevents.com/ascendasia2015

17-20 May

ALTA CCMA
Punta Cana, Dominican Republic
alta.aero/ccma

19-21 May

EBACE
Geneva, Switzerland
ebace.aero/2015

26-28 May

AP&M Europe
Olympia London, UK
apmexpo.com

31 May - 3 June

**1st International Symposium on
Sustainable Aviation (ISSA)**
Istanbul, Turkey
issasci.org

4-6 June

France Air Expo
Lyon-Bron airport, France
franceairexpo.com

15-21 June

Paris Air Show
Le Bourget, Paris
siae.fr

30 June

Ascend Europe: Finance Forum
London
flightglobalevents.com/
ascendeurope2015

17-19 July

Royal International Air Tattoo
RAF Fairford, Gloucestershire, UK
airtattoo.com

18-20 September

Midden-Zeeland airport fly-in
Arnhem, the Netherlands
neeland-airport.nl

1-2 October

**2nd Annual Central Asian Aviation
Symposium**
Almaty, Kazakhstan
www.aeropodium.com/caa.html

17-19 November

NBAA 2015
www.nbaa.org/events/bace/2015



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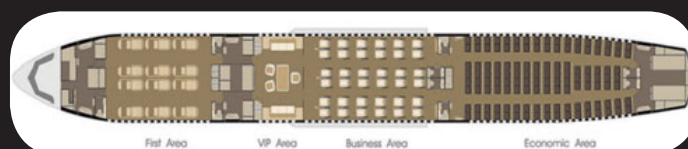
50,173 Hours Total Time, Cycles Since New 9,591

ENGINES

Type: CFM 56-5C4 Manufacturer: CFMI
Engine #1 741727 Cycles remaining 4,570
Engine #2 741809 Cycles remaining 2,294
Engine #3 741811 Cycles remaining 4,161
Engine #4 741728 Cycles remaining 3,903

APU

Model GTCP331-350C P/N 3800454-6 S/N R-370C



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Biman BANGLADESH AIRLINES LTD.

HEAD OFFICE, BALAKA, KURMITOLA, DHAKA-1229, BANGLADESH
PHONE: 8901600-14, 8901680-94, FAX: 88-02-8901558, www.biman-airlines.com
Ref: DACPM/737-800/154/2015/1456 Date: 19 February 2015

Request for Proposal (RFP) for dry lease of one 737-800 aircraft

1. Biman Bangladesh Airlines Ltd. invites Proposal/Offer for taking of 01 (one) 737-800 aircraft for a period of 60 (sixty) months on dry lease basis. Airlines, Operators, Owners of Aircraft, Manufacturers, Leasing Companies having aircraft of its own or legally authorized by the owner may participate in the RFP complying with the terms & conditions given in the RFP Schedule. Basic requirements are mentioned below:

a. Number and Type of Aircraft	01 (one) 737-800 aircraft.
b. Seat Configuration	Two class configuration with 162 (12J+150Y) seats. All seats shall have to be in good condition.
c. Age of the Aircraft	The aircraft should not be more than 10 years of age as on closing date of RFP.
d. Nature and period of Lease	Dry Lease for a period of 60 (sixty) months.
e. Commencement of Lease	July 2015.
f. Representation & Authorization	If the Bidder/Lessor is not the owner of the aircraft, then owner's authorization/ mandate must be submitted prior to negotiation.

2. Detailed information is available in the RFP Schedule. RFP Notice and Schedule may be viewed at Biman's website: www.biman-airlines.com .
3. The Proposal/Offer may be submitted to the General Manager (Corporate Planning) at E-mail: dacpm154@bdbiman.com by 1000 hours LT (0400 hrs UTC) on 16 March 2015. Proposal/Offer may also be submitted through Courier Service or dropped in the Box placed in the Office of the General Manager (Corporate Planning), Biman Head Office, Balaka, Kurmitola, Dhaka-1229 within the stipulated time. The Proposal(s)/Offer(s) will be opened immediately after the closing time in presence of the Bidder(s), if any. No Proposal/Offer would be accepted after the closing time. Biman Bangladesh Airlines Ltd. will not be responsible for late receipt of Proposal/Offer due to any reason, whatsoever.
4. For further information or query, General Manager (Corporate Planning) may be contacted at Telephone: +880-2-8901600/Extension-2415, +880-2-8901697 (direct), Fax: +880-2-8901396, E-mail: gmp@bdbiman.com during the office hours.
5. Biman Bangladesh Airlines Ltd. reserves the right to accept or reject any or all the Proposals/Offer at any time and/or stage without assigning any reason, whatsoever, and no claim will be entertained in this regard.

Mohd. Abdur Rahman Faruky
General Manager Corporate Planning (Acting)



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PHONE: 8901600-14, 8901680-94, FAX: 88-02-8901558, www.biman-airlines.com
Ref: DACPM/777-300ER/155/2015/1461 Date: 24 February 2015

Request for Proposal (RFP) for Dry Lease of one 777-300ER Aircraft

1. Biman Bangladesh Airlines Ltd. invites offers/proposals for Dry Lease of 01 (one) 777-300ER aircraft for a period of 60 (sixty) months. Airlines, Operators, Owners of Aircraft, Manufacturers, Leasing Companies having aircraft of its own or legally authorized by the owner to submit the offer, may participate in the RFP complying with the terms & conditions stated in the RFP schedule. Basic requirements are mentioned below:

i. Number and Type of Aircraft	01 (one) 777-300ER aircraft.
ii. Nature & Period of Lease	Dry Lease for 60 (sixty) months.
iii. Configuration	Two class configuration not less than 419 seats. All seats shall have to be in good condition.
iv. Age of the Aircraft	The aircraft should not be more than 10 years of age as on closing date of RFP.
v. Authorization	If the lessor is not the owner of the aircraft, owner's authorization/mandate must be submitted prior to negotiation.
vi. Commencement of Lease	July 2015

2. Detailed terms and conditions have been given in the RFP schedule. RFP notice and schedule may be viewed in Biman's web-site: www.biman-airlines.com .
3. The Offers/Proposals are to be submitted latest by 1000 hours LT (0400 hrs UTC) 19 March 2015 addressed to General Manager (Corporate Planning), Biman Bangladesh Airlines Ltd., Head Office, Balaka, Dhaka, Bangladesh through E-mail at dacpm155@bdbiman.com. Proposals/offers may also be submitted through courier service or dropped in the Tender Box placed in the office of General Manager (Corporate Planning), Biman Head Office, Balaka, Kurmitola, Dhaka-1229. No offer/proposal will be accepted after the closing time and date.
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5. Biman Bangladesh Airlines Ltd. reserves the right to accept or reject any or all the offers/proposals partly or wholly without assigning any reason whatsoever and no claim shall be entertained in this regard.

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Ref: DACPM/777-200ER/153/2015/1455 Date: 19 February 2015

Request for Proposal (RFP) for Dry Lease of one 777-200ER Aircraft

1. Biman Bangladesh Airlines Ltd. invites offers/proposals for Dry Lease of 01 (one) 777-200ER aircraft for a period of 60 (sixty) months. Airlines, Operators, Owners of Aircraft, Manufacturers, Leasing Companies having aircraft of its own or legally authorized by the owner to submit the offer, may participate in the RFP complying with the terms & conditions stated in the RFP schedule. Basic requirements are mentioned below:

i. Number and Type of Aircraft	01 (one) 777-200ER aircraft powered by PW4090 engine
ii. Nature & Period of Lease	Dry Lease for 60 (sixty) months.
iii. Configuration	Two class standard configuration not less than 319 seats. All seats shall have to be in good condition.
iv. Age of the Aircraft	The aircraft should not be more than 10 years of age as on closing date of RFP.
v. Authorization	If the Lessor is not owner of the aircraft, owner's authorization/mandate must be submitted prior to negotiation
vi. Commencement of Lease	July 2015

2. Detailed terms and conditions have been given in the RFP schedule. RFP notice and schedule may be viewed in Biman's web-site: www.biman-airlines.com .
3. The Offers/Proposals are to be submitted latest by 1000 hours LT (0400 hrs UTC) 15 March 2015 addressed to General Manager (Corporate Planning), Biman Bangladesh Airlines Ltd., Head Office, Balaka, Dhaka, Bangladesh through E-mail at dacpm153@bdbiman.com. Proposals/offers may also be submitted through courier service or dropped in the Tender Box placed in the office of General Manager (Corporate Planning), Biman Head Office, Balaka, Kurmitola, Dhaka-1229. No offer/proposal will be accepted after the closing time and date.
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Ref: DACPM/156/2015/1490

Date: 06 April 2015

Amendment to the RFP (Request for Proposal) for ACMI (WET) lease of two aircraft

Reference is drawn to the Request for Proposal (RFP) ref. DACPM/156/2015/1477 dated 25 March 2015 regarding ACMI lease of 02(two) aircraft for a period of three months. The RFP Notice and Schedule were posted in the official website of Biman (www.biman-airlines.com) on 25th March 2015. The same was also published in the daily Kalerkantha and the daily Star on 27th March 2015 and 28th March 2015 respectively. The RFP is hereby amended to read as follows:

Clause reference	Existing provision	Amended provision
Seat Configuration	Aircraft must have minimum 300 seats in two class	Aircraft must have minimum 250 seats in two class
Last date for submission of offer	Latest by 1000 hrs BST (0400 hours UTC) on 16 April 2015	Latest by 1000 hrs BST (0400 hours UTC) on 28 April 2015

All other terms and conditions of the RFP Schedule will remain unchanged.

Mohd. Abdur Rahman Faruky
General Manager Corporate Planning (Acting)

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- Very good written and spoken English
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WORK EXPERIENCE DAVE THOMPSON

Maintaining the highest standard

Dave Thompson has spent 21 years leading a 13-strong team of Dassault Falcon airframe mechanics at Duncan Aviation. His responsibilities involve scheduling, team building and ensuring quality levels are met

What was your first aviation job?

My first aviation job was with Sabreliner in Perryville, Missouri, where I worked on the life extension project on the Sabreliner models. I performed mostly sheet metal repair, corrosion removal and completed service bulletins.

I then worked in Sauget, Illinois, for a smaller repair shop named Avtec. There, I was part of the structures installation crew for building cargo doors and performed associated modifications to hydraulic components, re-routing electrical wiring and emergency controls for landing gear and pressurisation/conditioning components on the Dassault Falcon 20.

That was excellent experience for improving and building skills that through the years have proven very useful in many areas of aviation maintenance.

In 1994, I started working at Duncan Aviation's Lincoln, Nebraska, facility. I was hired on as a beginning airframe mechanic and worked up to a lead mechanic position. I am now the team leader of one of our four Falcon teams in Lincoln.

What services does Duncan Aviation offer?

It provides nose-to-tail support services for the most popular business jets in use today. These services include airframe and engine maintenance, avionics modifications, paint and interior completions, avionics, instrument and accessory repair and overhauls, parts support and aircraft sales and acquisitions.



Duncan Aviation currently has more than 2,000 team members located around the world and supporting customers from more than 30 full-service and specialised service locations.

What are your regular duties?

There are 13 airframe mechanics who are part of my team and they have anywhere between six months to 15 years of experience. My regular duties include the scheduling of aircraft for inspections and service, team building, organisation and direction of personnel on multiple in-house projects, customer support, performing basic maintenance and inspections, troubleshooting, performing engine and airframe ground runs and assisting with required test flights.

"I work with some great people on a variety of expensive and sophisticated aircraft"

What can be challenging?

The most difficult part of my job is supporting each team member and ensuring that they have the resources, including parts, materials and staff, each day to be successful in their work. We juggle work on several projects concurrently and it is typical that we have at least three aircraft under our care at any given time.

One interesting thing that I get involved in is the continual improvement of my team as

well as the entire airframe department at Duncan Aviation. We strive to continually improve our methods of maintenance and our work efficiency in all areas.

I work with other departments to develop techniques to assist our teams in communication and collaboration so we can deliver projects in faster turntimes than our competitors provide. And we work to improve our methods in maintenance documentation so we can keep the tools in the mechanic's hands instead of having them spend valuable time typing and writing.

What's are your favourite and least favourite parts?

I really enjoy what I do as the variety is endless. Duncan Aviation provides me with the opportunity to work side-by-side with great people on a variety of expensive, sophisticated aircraft. I consider it a privilege to do what I do and I take my work very seriously.

I wouldn't say I dislike any part of my job, but the task that I struggle the most with is ensuring that our teams work as efficiently as possible so we can deliver affordable and high quality maintenance for our customers. ■



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